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BAWDEN (F. C.) & KASSANIS (B.). **The suppression of one plant virus by another.** —*Ann. appl. Biol.*, xxxii, 1, pp. 52–57, 1 pl., 1945.

Inoculations of potato, tobacco, and cucumber plants, using severe tobacco etch (S.E.V.), and mild tobacco etch (M.E.V.) viruses, potato virus Y (P.V.*Y*), *Hyoscyamus* virus 3 (Hy.V. 3), and a strain of cucumber virus 1 (C.V. 1) causing a mild mottle in tobacco (all viruses transmitted by *Myzus persicae* and having similar relationships with their insect vector) showed that S.E.V. prevents the multiplication of P.V.*Y* and Hy.V. 3 and replaces them even in plants in which they are established. M.E.V. reduces the concentration of P.V.*Y* but does not suppress it completely. C.V. 1 multiplies normally in mixed infections with any of the other three viruses.

It is suggested that the interactions of S.E.V., P.V.*Y*, and Hy.V. 3 differ from the phenomenon of reciprocal protection. Firstly, there is nothing to suggest that C.V. 1 is less closely related to Hy.V. 3 and P.V.*Y* than these are to one another. Secondly, although S.E.V. protects plants against P.V.*Y* and Hy.V. 3, M.E.V., which protects against S.E.V., does not completely protect against P.V.*Y* or Hy.V. 3 and only partially replaces them. It is possible that S.E.V. does not occupy all the sites suitable for the attachment of P.V.*Y* or Hy.V. 3 and so does not prevent the establishment of these viruses, but that it affects the metabolism of the cells so that some material or enzyme system essential for the multiplication of P.V.*Y* and Hy.V. 3 is no longer produced.

Plantesygdomme i Danmark 1939, 1941, 1942, 1943. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1939, 1941, 1942, and 1943. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, xlv, pp. 193–265, 2 figs., 2 graphs, 1940; xlvii, pp. 190–277, 4 figs., 2 graphs, 1942; xlviii, pp. 1–90, 2 figs., 2 graphs, 1943; xlix, pp. 1–72, 1 fig., 2 graphs, 1944. [English summaries.]

These reports, compiled on the usual lines [*R.A.M.*, xxii, p. 90] by E. GRAM, H. R. HANSEN, and Anna WEBER, contain the following among many other items of interest, besides some already noticed from different sources. In 1939 *Helminthosporium avenae*, of rare occurrence in Denmark, was detected on a number of oats samples. In 1942 *Claviceps purpurea* was very prevalent on rye in parts of Jutland.

Beets are seldom attacked in Denmark by *Actinomyces* spp., which were responsible for heavy damage to mangolds and sugar beets in 1939. In 1944 *Uromyces betae* entirely destroyed beet foliage in several localities, and *Peronospora schachtii* was also very virulent, its intensity reaching a climax of 15 to 20 per cent. in July.

The numbers of new municipalities harbouring potato wart (*Synchytrium endobioticum*) in 1939, 1941, 1942, and 1943 were 11, 16, 17, and 14, respectively.

In 1944 the application to the soil of brassicol at the rate of 20 gm. per sq. m. prevented the development of *A. scabies* on radish.

P. schleideni [*P. destructor*] was exceptionally widespread, often in conjunction with *Stemphylium botryosum* [*Pleospora herbarum*], on onions in 1942.

In all the years under review, potato leaf roll and mosaic [ibid., xvii, p. 338] were prevalent and severe. In 1943 the provincial farmers' unions set up a joint organization aiming at the production of virus-free seed stocks.

'Stony pit' of pears [ibid., xxiii, p. 447] was very common in 1943, especially on the Greve A. W. Moltke variety in home gardens. In the same season, marginal leaf scorch of currants was, as usual, much in evidence: in three localities with soils of a high potassium content the trouble was effectively combated by applications of ammonium sulphate at a dosage of 6 kg. per are [100 sq. m.], whereas the same quantity of potassium sulphate aggravated the symptoms.

Phoma medicaginis [*Pleospora rehmiana*: ibid., xvi, p. 184] was observed for the first time in the country on lucerne in 1939, when it also reappeared on *Medicago lupulina*, a host in 1937.

Among new records may be mentioned *Septoria nodorum* on wheat in 1941; *Alternaria solani* on tomato leaves, *Gymnosporangium clavariiforme* on pears, and *Peronospora manshurica* on soy-bean foliage in 1942; and a condition suggestive of lily mosaic (*Cucumis* virus 1) [cucumber mosaic virus] in 1943, one of the affected varieties being *Lilium philippinense* var. *formosanum*.

Viljoen (P. R.). **Report of the Department of Agriculture and Forestry for the year ended 31 August, 1944.**—*Fmg S. Afr.*, xx, 228, pp. 131–193, 1945.

The following items are among the brief references to plant diseases (pp. 189–190) in this report [cf. *R.A.M.*, xxiii, p. 251]. Good progress is being made in the production of seed potatoes free from the common virus diseases in South Africa and it is expected stocks will become available commercially in about two years. Wart disease [*Synchytrium endobioticum*] has not been observed for many years, and there is reason to believe that it has been eradicated.

A virus disease of apples (mosaic chlorosis) is being closely studied [ibid., xxiii, p. 134].

The so-called foot-rot diseases of wheat [*Helminthosporium sativum* and associated fungi: ibid., xx, p. 150] cause considerable damage in the Caledon and Bredasdorp areas. In the case of true foot rot [*Ophiobolus graminis*: loc. cit.], seed disinfection with ceresan or agrosan improved the stands.

On p. 182 it is stated that the position in those parts of the eastern Cape Province where jointed cactus [*Opuntia aurantiaca*] grows is again becoming serious, as the weed is spreading almost everywhere. In 1937, mechanical eradication was discontinued in favour of destruction by the cochineal insect [*Dactylopius confusus*], but this insect no longer seems able to keep the weed in check, mainly owing to infection by *Empusa* sp.

Eighteenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1944.—78 pp., 1944.

This report from Australia [cf. *R.A.M.*, xxiv, p. 91] contains, *inter alia*, the following items of interest. In further out-of-door pot tests in 1943 on the influence of plant depletion on the damage caused to wheat by take-all [*Ophiobolus graminis*: loc. cit.], sodium nitrate was included in the treatments given, being added to four contaminated and four control pots in each series. The results of the 1943 tests indicate that in the third year of the trial the total weight of the plants and the weight of grain borne by the plants in the pots receiving 250 gm. burnt lime were outstanding; plants with 250 gm. ground limestone and those with 250 gm. ground magnesite were also well above the corresponding plants grown in the native soil as well as in the native soil plus other chemicals. The roots in the three series mentioned, particularly those in the ground limestone treatment, were also freer from rotting than the others. There was no evidence of significant differences between any of the added chemical compounds on the number of pots containing

plants with whiteheads or plants with small, pinched grain. Comparing the contaminated with the uncontaminated native soil, the total weight of plants, and, to a less degree, the total grain weight borne in the pots to which the organism was added, were significantly greater than those from the uncontaminated controls. This is the second reversal in the relative magnitude of the yields, the position in 1943 being the same as in 1941 and the opposite of that in 1942. The addition of sodium nitrate in 1943 increased the total weight of the plants and their grain yield, but had no effect on grain size, the number of pots with white-headed plants, or the health of the root system.

Arrangements were made by the Commonwealth Department of Commerce and Agriculture through the State Departments of Agriculture for the permanent maintenance and multiplication of stocks of Up-to-date and Bismarck potatoes free from virus X [ibid., xxiv, p. 335]. All stocks incorporated in the scheme are labelled F X (free from X virus). The nuclear stocks are being multiplied in Tasmania for distribution to State Departments of Agriculture, who will place the produce with chosen farmers for further multiplication. Final distribution will be through the established seed certification schemes.

Further work was done on the selection and purification of the component strains of the tomato spotted wilt virus. The wide variability of the symptoms was adequately explained by the existence of these strains. Protective inoculation by means of the mild strain was shown to offer distinct possibilities, but it was found that the mild strain would have to be purified before it could be used to the best advantage.

In the winter of 1943 cauliflowers and swedes were attacked by broccoli mosaic [cauliflower mosaic virus: ibid., xxii, p. 122]. The vector was found to be *Brevicoryne brassicae*.

[In the previous report [ibid., xxiv, p. 92] it should have been stated that the work on susceptibility of citrus rootstocks to *Phytophthora citrophthora* was carried out by officers of the New South Wales Department of Agriculture.]

Fifty-seventh Annual Report of the Kentucky Agricultural Experiment Station for the year 1944.—68 pp., 1945.

In this report [cf. *R.A.M.*, xxiii, p. 430], it is stated that the tobacco variety Ky 41 A [loc. cit.] resistant to [black] root rot [*Thielaviopsis basicola*] is rapidly increasing in popularity in Kentucky, 52·2 acres being grown for seed by 39 farmers in 1944, as against 39·4 acres of Ky 16 by 24. There is enough seed of these two resistant varieties to plant the entire Burley acreage of the United States in 1945.

Several mosaic-resistant (N.N.) Burley varieties, including Ky 54 and Ky 55, produced by repeatedly back-crossing Ky 16 on mosaic-resistant plants of succeeding generations, were tested by farmers and found to be highly satisfactory as regards mosaic resistance and quality. Ky 34, a new Burley variety resistant to black root rot, *Fusarium* wilt [*F. oxysporum* var. *nicotianae*: ibid., xxii, p. 456], and mosaic (N.N.), in a test of 12 varieties yielded about one-third more than any other. Ky 150, a new mosaic-resistant (N.N.) dark tobacco, almost identical, except in mosaic resistance, with Brown Leaf, from which it was developed, gave satisfactory results in commercial plantings. Ky 160, a new, mosaic-resistant (N.N.) one-sucker variety, also gave satisfactory results in commercial plantings; it was developed by back-crosses of One Sucker on mosaic-resistant plants derived from Samsoun.

The organism causing bacterial black stalk of tobacco, found in comparative tests to differ from *Bacillus carotovorus* [*Erwinia carotovora*], *Bacterium* [*Xanthomonas*] *solanacearum*, *Pseudomonas fluorescens*, *P. aeruginosa*, and *P. polycolor*, was ascertained to have something in common with the carrot soft-rot organism,

E. carotovora, in point of pathogenicity, except that it produced a drier soft rot in tobacco stalks, tomato fruits, and potato. It became systemic in a [chilli] pepper plant and was isolated from necrotic spots in the fruit on a plant inoculated on the stalk. Typical black stalk was not produced by inoculation of tobacco plants of different ages.

Tests made to develop a method by which the roots of tobacco plants bearing the causal agents of wildfire [*P. tabacum*] and angular leaf spot [*P. angulata*] in the plant-bed could be freed from these organisms at transplanting showed that washed roots of wheat or tobacco dipped in a bacterial suspension developed more bacteria than unwashed roots. Plants so treated were dipped in various chemicals, re-potted, and then tested for bacteria after 24 hours. The number of infections which resulted was reduced from several hundred on untreated roots to a few by root treatment with Bordeaux mixture (2–2–100), copper sulphate and water (1 in 400), and iron sulphate, hydrated lime, and water (2–2–100).

The tomato pathogen *X. vesicatoria* was recovered from the roots of wheat plants during winter, growing outdoors in non-sterilized soil inoculated in the autumn. *Bacterium angulatum* [*P. angulata*] was again recovered from wheat roots in winter [ibid., xxiii, p. 476].

Cercospora cultures were made from 32 species of plants for comparison with the tobacco frog-eye fungus [*C. nicotianae*]. The cultures from *Petunia* and blackberry seemed quite different, while cultures from other species were very similar to cultures from tobacco, especially in the rapidly-growing vegetative phase.

Serious internal corky spots in the fruit and dropping were prevalent on previously affected Yellow Transparent apple trees not treated with borax, though no internal cork and only very slight dropping occurred on trees treated with borax in 1943. Winesap and Anoka trees were affected in 1944 for the first time.

Quince rust of apple [*Gymnosporangium clavipes*: ibid., xix, p. 28] for several years past has caused serious loss of fruit in the Western sub-station orchard. Trees sprayed in 1944 with a mixture of ½lb. fermate and 3 lb. wettable sulphur per 100 gals. yielded an average of 5 bush. per tree in the Stayman variety, 2 bush. in Delicious, and 1 bush. in Winesap more than trees sprayed with the same number of straight sulphur sprays (6 lb. per 100). Counts of dropped fruits from 12 trees of each variety from June to harvest showed that only 7 per cent. of those from the fermate-sprayed trees were infected, as against 53 per cent. for the straight-sulphur trees.

Osmun (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1943–4* (*Bull.* 417), pp. 18–24, 1944.

This report [cf. *R.A.M.*, xvii, p. 502] contains, *inter alia*, the following items of interest. M. A. McKenzie and A. V. Osmun state that *Ceratostomella ulmi* [ibid., xxii, p. 504; xxiii, p. 367] has been isolated from 17 trees in eight municipalities in Massachusetts; all the affected trees have been removed and burnt.

Rust of red [*Fraxinus pennsylvanica*], green [*F. p.* var. *lanceolata*], and possibly other species of ash caused by *Puccinia peridermiospora* [ibid., xx, p. 138] was very prevalent in the coastal areas of Massachusetts during the early summer of 1943.

Dealing with damping-off and growth of seedlings and cuttings of woody plants, W. L. Doran states that working in co-operation with J. S. Bailey he found that arasan or spergon, added to indolebutyric acid in talc, caused no injury to cuttings of the several species with which they were used. In work with L. Southwick such use of spergon prolonged the life of unrooted apple cuttings.

The application of a very dilute solution of formaldehyde to soil immediately after seeding was found to be a safe, convenient, and simple method for preventing post-emergency damping-off of plants. This treatment is readily combined with

sub-irrigation immediately after seeding. In the absence of any chemical soil treatment against damping-off, stands of vegetable seedlings under glass may be improved by postponing the first watering. Stands of eight commonly grown vegetables were better when the soil was not watered until three to five days after seeding.

In work with T. Sproston on onion smut [*Urocystis cepulae*], soil treatments with sodium nitrite, fermate, or urea markedly reduced severity of infection, though urea, unless applied to soil a considerable time before seeding, may adversely affect germination or growth.

Urea was a safe and effective soil fungicide with peas on a limed sandy soil. Fermate, applied to soil immediately before, or elgetol, ammonium dichromate, or potassium chromate, applied immediately after, seeding, gave good and safe control of damping-off of certain unspecified vegetables. As seed treatments for vegetables, ammonium, potassium, and sodium dichromate, diluted with graphite gave good results, comparable with those given by new proprietary treatments. Seed treatment of beet with arasan, of cucumber with semesan, and of lettuce with spergon prevented pre-emergence damping-off equally well, whether the soil was first watered 1, 2, 3, 4, or 5 days after seeding.

L. H. Jones states that when Havana Seed tobacco seedlings were established at a soil temperature of 70° and one-fourth were inoculated with a mosaic virus, and when 24 hours later the soil temperatures were altered to establish a range from 50° to 95° at intervals of 5°, at all temperatures the inoculated plants showed the typical pattern of mosaic infection by the thirteenth day, but on the plants at 90° and 95° terminal growth gradually stopped and a rosette of frenched leaves appeared at the top, while at temperatures under 90° the common mosaic pattern continued. These results were confirmed when the pots at 95° were interchanged with those at 50° soil temperature.

On p. 6, W. S. Eisenmenger and K. J. Kucinski state that in work on tobacco brown root rot [ibid., xvii, p. 774] carried out to determine the effect of the preceding crop on yield and crop index, it was found that sunflowers, Jerusalem artichokes [*Helianthus tuberosus*], tobacco, and fallow were satisfactory in this respect, buckwheat, barley, rape [*Brassica napus* var. *oleifera*], millet [*Panicum miliaceum*], wheat, and rye less so, and maize, oats, Sudan grass, and sorghum consistently unfavourable.

W. B. Esselen, W. H. Fitzpatrick, H. J. Brunell, and A. Filios (p. 45) state that commercially-grown mushrooms (*Agaricus* [*Psalliota*] *campestris*) can be dehydrated successfully. The thiamine, riboflavin, and nicotinic acid contents remain stable during dehydration and storage of the dried product. The rapid freezing of mushrooms gave a satisfactory, well-flavoured product, in which thiamine, riboflavin, and nicotinic acid were well retained. When *P. campestris* was fed to white rats as their sole source of protein, the animals survived and grew. All the essential amino acids appear to be present in mushrooms, though in lower concentrations than in casein. Chemical analysis showed that about 63 per cent. of the total nitrogen of mushrooms is present in the form of a protein. This protein was shown by chemical tests to contain phenylalamine, histidine, leucine, lysine, arginine, tryptophane, and threonine. The essential amino acids which failed to give positive tests were valine, isoleucine, and methionine, but animal feeding trials showed them to be present.

Sixty-fourth and sixty-fifth Annual Reports of the North Carolina Agricultural Experiment Station, 1940–1 and 1941–2.—83 pp., 31 figs., 2 maps, [?1941]; 92 pp., 21 figs., 1 diag., 5 graphs, 1 map, [?1942. Received July, 1945.]

The following items of phytopathological interest occur in these reports [cf. *R.A.M.*, xviii, p. 787], besides those already noticed from other sources. The use

of resistant varieties is the only effective means of cotton wilt [*Fusarium vasinfectum*] control. Coker 4 in 1 is highly resistant and very productive, and Clevewilt, Wannamaker Stonewilt, and certain strains of Dixie Triumph have also proved very satisfactory in these respects. Coker 100 wilt-resistant does not withstand infection quite as well as 4 in 1, but its yields are approximately the same, and it may safely be planted on lightly infested soils [cf. ibid., xxiii, p. 225]. Liberal applications of potash are of some assistance, in conjunction with the use of resistant varieties, in combating the disease, which is most prevalent and destructive in the light, sandy soils of the Coastal Plain.

Borax mixed into the fertilizer at rates not exceeding 25 to 35 lb. per acre gave good control of lucerne yellows [ibid., xxiii, pp. 110, 288] and increased hay and seed yields. At the Piedmont Branch Station in 1942, damage from boron deficiency on untreated soils ranged from 25 per cent. in Grimm to 49 per cent. in Turkestan, the reaction of Kansas Common being intermediate. No injury occurred among crops given 25 lb. borax per acre. The seed yield has been correspondingly increased, plots receiving borax producing 110 to 173 lb. per acre compared with 9 to 30 from the untreated.

Root, stem, and fruit rots of groundnuts are a limiting factor in the production of the crop under local conditions, among the pathogens concerned being *Fusarium* spp., *Sclerotium bataticola* [*Macrophomina phaseoli*], *Rhizoctonia*, and *S. rolfsii* in that order of prevalence.

Two promising new oat varieties resistant to smut [*Ustilago avenae* and *U. kolleri*] and rust [*Puccinia coronata*] are Lelina and Letoria, crosses between Lee and Victoria.

The most important spray applications for apple bitter rot [*Glomerella cingulata*] control were the third and fourth covers, and better results were obtained in 1941 by using 1 in 40 lime-sulphur up to and including the calyx and 4–4–50 Bordeaux thereafter than by either preparation alone throughout the season. In 1942 basic copper sulphate and copper oxychloride were tested as substitutes for Bordeaux (which causes severe russeting of foliage and fruit) against *G. cingulata* and black rot [*Physalospora obtusa*]. Neither they nor a weaker Bordeaux formula (1–3–50) were as effective as the stronger mixture, but copper injury was virtually obviated by their use.

Granville wilt (*Bacterium* [*Xanthomonas*] *solanacearum*), best known as a virulent pathogen of tobacco, is assuming a severe form on home-grown tomatoes in the State, where Louisiana Pink is the only resistant commercial variety.

Pre-emergence seed decay and damping-off in lettuce were experimentally shown in 1942 to be largely preventable by seed treatment with yellow cuprocide or spergon, while pre-sowing applications to the soil of formaldehyde or chloropicrin were effective against the post-emergence phase of the disease.

Purple top [aster yellows virus] was responsible for heavy damage to potatoes [ibid., xxiv, p. 70] in 1942. A sample of table stock examined at Asheville contained 80 per cent. diseased tubers, while seed stocks from Yancey and Watauga Counties showed 38 and 30 per cent., respectively. The disease spreads rapidly from one planting to another, probably by means of insects.

Brown (J. G.) & Boyle (Alice M.). **Crown gall cured with crude penicillin.**—*Desert Plant Life*, xvii, pp. 89–95, 5 figs., 1945.

The authors state that within a few hours of injecting penicillin (obtained from cultures of *Penicillium notatum* in the laboratory) into a gall [*Bacterium tumefaciens: R.A.M.*, xxi, p. 247] on *Bryophyllum pinnatum* small, brown areas appeared just above the punctures. The penicillin appeared, however, to diffuse upwards rather than laterally, and consequently a second method was tried in which cotton wool, soaked in penicillin, was wrapped round the gall and the latter then stabbed. The

'flesh' of the gall appeared watersoaked internally, turned brown, shrank and died and could easily be picked to pieces after a few days. The same treatment is claimed to have cured crown gall on apricots.

White (P. R.). **Metastatic (graft) tumors of bacteria-free crown-galls on Vinca rosea.**—*Amer. J. Bot.*, xxxii, 5, pp. 237–241, 7 figs., 1945.

The author received from Dr. A. C. Braun bacteria-free tumours [*R.A.M.*, xxiii, p. 8] of *Vinca rosea* isolated as follows. Young, healthy plants of *V. rosea* were inoculated with the highly virulent brown peach strain of *Phytomonas* [*Bacterium*] *tumefaciens*, and after five days, the temperature was raised to 46° to 47° C. (lethal to the bacteria) for a further five days after which the plants were returned to the greenhouse at about 25° for about ten weeks. The author opened mature galls thus obtained and fragments of the softer tissue were removed and placed on a semi-solid medium. Of 23 aseptic cultures resulting one was selected from which a clone of 25 rapidly growing cultures was built up. The cultures were brilliant white, and in microscopic structure the general texture was uniformly open with many giant cells and scattered scalariform cells. A series of five pairs of primary xylem elements was found to be arranged in a perfect arc.

At the end of the twentieth passage (39 weeks after isolation) fragments of 17 cultures were grafted into young, healthy *V. rosea* plants by the double incision method. Of this series, four (24 per cent.) formed tumours. Of 42 grafts made from material of the nineteenth and twentieth passages 33 (79 per cent.) formed tumours of clean, smooth, fleshy texture, and up to 20 mm. in diameter, regularly exceeding in size those produced by inoculation with bacteria. The structure of these tumours and of the tumour-host connexion showed no significant difference from the bacteria-free galls of sunflower and *Nicotiana*.

Yu (T. F.), Wang (H. R.), & Fang (C. T.). **Varietal resistance and susceptibility of Wheat to flag smut (Urocystis tritici Koern.). IV. Further studies on physiologic specialization in Urocystis tritici Koern.**—*Phytopathology*, xxxv, 5, pp. 332–338, 1945.

Further studies on physiologic specialization in wheat flag smut (*Urocystis tritici*) at the Tsing Hua University, Kunming, Yunnan, China [*R.A.M.*, xvi, p. 305] on material from widely scattered districts led to the separation of a further seven races in addition to the five already known, on the basis of differences in their pathogenicity to four common varieties, Tsing Hua No. 1932, N–716, Ngochen, and Grassland, and one poulard, Tsing Hua No. 559. Races 4 and 5 induce symptoms of intermediate severity on Nanking No. 715, a well-known flag smut-resistant variety. Race 12, collected on a poulard wheat, is the only race pathogenic to *Triticum turgidum*. Of the five races occurring in Yunnan, 2 is particularly widespread, having been represented four times in seven collections. The pathogenicity of races 1 to 5 has remained stable for 11 years.

Johnson (F.). **Epiphytology of winter Wheat mosaic.**—*Ohio J. Sci.*, xlv, 3, pp. 85–96, 2 figs., 1945.

The author gives a brief description of the mosaic disease of winter wheat (which is stated to occur in Illinois, Indiana, Kansas, Maryland, Nebraska, North Carolina, and Virginia) based on symptoms appearing on susceptible varieties infected under field conditions east of the Mississippi river. The affected areas were found to be irregular in shape, varying in size from a few feet in circumference to patches covering most of a field. The margins of these patches are more sharply defined than those surrounding diseased areas caused by unfavourable soil relations. There are two types of symptoms of wheat mosaic, the first, affecting the variety Harvest Queen, being characterized by a rosetted condition, accompanied by

excessive tillering, the plants acquiring a very dwarfed, compact appearance, and being darker green than healthy specimens. The second condition is produced in highly susceptible varieties, such as Purdue No. 1, Purkof, and Illinois No. 2, and causes stunting without excessive tillering, the plants becoming dwarfed, of compact appearance, with light yellow circular to oblong areas or showing large, chlorotic streaks parallel to the leaf veins, mingling with the normal green. This aspect constitutes what is known as yellow [*R.A.M.*, xxiii, p. 479], as opposed to green mosaic. Plants may survive the acute phase of the disease and produce imperfectly filled spikes shorter than those of healthy plants.

The virus is transmitted with difficulty by mechanical means, but the disease can be induced in wheat by subjecting plants grown in virus-infested soil for 18 days to temperatures of about 60° F. Attempts to transmit the disease by various insects and nematodes failed and several species of plants were inoculated, but none except wheat developed symptoms.

Two viruses may be considered as causing mosaic of winter wheat in the United States. The virus east of the Mississippi river is transmitted through the soil and induces the formation of vacuolated intracellular bodies in cells of affected plants. The western virus is not transmitted through the soil but an unidentified aphid is reported to be a vector; the virus produces no intracellular bodies in cells of diseased plants. The virus causing mosaic in Japan [ibid., xviii, p. 98] is probably closely related to the eastern virus present in the United States, but the wheat virus in Russia [ibid., xxi, p. 251; xxiii, p. 257] has characteristics of both the eastern and western United States viruses. The only practical method of control is to grow resistant varieties. Several of these, found by Koehler, Bonnett, and McKinney (Leafl. *Ill. agric. Exp. Sta.* and *U.S. Dep. Agric.* (Mimeographed), 1939) to give good yields in virus-infested soil, are listed in order of yield namely, Fulhard, Prairie, Nabob, Wabash, Fulcaster, Duffy, Thorne, Cooperatorka, Fulhio, Michigan Amber, Inivira, Harvest Queen 34–1, Red Wave, Shepherd, and Trumbull.

Åberg (E.). **Effect of vernalization on the development of stripe in Barley.**—*Phytopathology*, xxxv, 5, pp. 367–368, 1945.

At the Idaho Agricultural Experiment Station vernalized seed from North Carolina of six hooded barley varieties (Brugh 76, Huga, Tucker, Early Beardless, Hooded 16, and Iredell) and one rough-awned (Wintex) was sown on 8th April, 1944, for comparison with non-vernalized material of the same origin. The vernalization process was carried out at the Plant Industry Station, Beltsville, Maryland, and occupied a period of 38 days, during which the temperature in the refrigerator was maintained at 33° to 34° F. between 23rd February and 15th March and at 31° to 32° from 16th March until 1st April, when the seed, which had been kept moist, was dried for three days prior to despatch. Stripe (*Helminthosporium gramineum*) began to develop on the vernalized plots at the beginning of June, and at harvest on 29th July the incidence of the disease ranged from 15 per cent. in Hooded 16 to 62 per cent. in Brugh 76, whereas the maximum in the non-vernalized controls was 9 per cent. It is suggested that a technique for testing varietal resistance to stripe might be based on a vernalization procedure.

Lewis (R. W.). **The field inoculation of Rye with Claviceps purpurea.**—*Phytopathology*, xxxv, 5, pp. 353–360, 1 fig., 1945.

A description is given of a technique devised at the Michigan Agricultural Experiment Station for the field inoculation of rye with *Claviceps purpurea* [*R.A.M.*, xviii, p. 314; xxii, p. 428, *et passim*] using a conidial suspension consisting of beaten and screened cultures of the fungus grown on moistened wheat for five or six weeks by Hynes's method [ibid., xxi, p. 135], to which is added an equal

weight of beet sugar. In this solution the spores can be stored for months without great loss of viability. The germination percentages of samples of these preparations after 38, 61, and 128 days storage at 18° C. were 70, 40, and 45, respectively, the corresponding figures for another series held at 0° being 70, 43, and 19, respectively. Some 4½ gals. of the sugar-spore suspension mixture can be made from 10 qts. culture.

Five fields were treated in 1943, three with a small orchard sprayer and two with a hand sprayer. In every field there was a great difference between the sprayed and unsprayed plots, the percentages of infected heads recorded in one field ranging from 22 to 43 and 3 to 6, respectively. The best time of day for the application of the conidial suspension is probably between 7 and 11 a.m., but further research on this factor and a number of others is requisite for the utilization to the best advantage of this new, good, and relatively simple method of ergot inoculation.

Reasonably well established facts concerning the quick decline disease of Orange trees.—*Calif. Citrogr.*, xxx, 4, p. 123, 1945.

The following facts relating to 'quick decline' of citrus [*R.A.M.*, xxiv, p. 312 and next abstracts] are embodied in a statement released by the Division of Plant Pathology, Citrus Experiment Station, University of California, Riverside, on 29th December, 1944. (1) The disease is at present confined to certain regions of the San Gabriel Valley. (2) The age of the affected trees ranges from two to 50 years and upwards. (3) The orchard soils concerned are predominantly of the light, sandy or gravelly texture normally regarded as ideal for orange cultivation. (4) During the last six years the area involved has extended, mainly to the north and east of Covina, while a second focus of infection has developed in the Sunnyslope section south-east of Pasadena. (5) The primary injury appears to be almost entirely localized in the fibrous feeder root system and smaller roots, which are destroyed. (6) Sudden wilting and foliar collapse are the secondary and most conspicuous effects of the disease on young bearing trees, but in the majority of cases the decline proceeds more slowly, the leaves fall gradually, and there is no complete collapse. (7) Collapsed bearing trees commonly produce yields above the average, but the fruits are often, though not invariably, below the average size. (8) Moderate to drastic pruning of affected trees results in some degree of recovery, though the top regeneration in such cases does not equal that of comparably treated healthy trees. (9) Hitherto, the disease has been observed only on sweet orange trees, such as Valencia and Navel, on sour orange rootstocks. (10) The wood and bark of the outer roots of trees in the incipient stages of 'quick decline' contain no starch [ibid., xxiv, p. 187] in contrast to the abundant reserves constantly present in the corresponding zones of healthy individuals. (11) The starch test applied to the inner surface of the bark above and below the bud union, which was found specific by Bitancourt for the diagnosis of 'tristeza' [root rot] in Brazil [ibid., xxiii, p. 484], gave entirely negative results when used on trees suffering from 'quick decline'.

Franco (C. M.). **Observações sôbre o 'quick decline' dos Citrus na California.** [Observations on the 'quick decline' of Citrus in California.]—*Biológico*, xi, 5, pp. 135–137, 1945.

Nine of the 11 facts accepted by the experts of the Division of Plant Pathology, Citrus Experiment Station, Riverside, California, as 'reasonably established' in relation to 'quick decline' [see preceding abstract] are equally applicable to the form of root rot known as 'tristeza' in Brazil [see next abstract]. At the time of writing, the author was still in doubt concerning the absence of starch in the outer root system of trees affected by the latter trouble, but the existence of this further corroborative symptom was verified, according to a footnote by N. da R., by

experiments in São Paulo. In another foot-note attention is drawn to a certain periodicity in the intensity of the reactions of diseased trees to the starch test, which does not, however, essentially modify the results. The author is convinced that 'quick decline' and 'tristeza' are the same disease, which probably spreads less rapidly in the cooler climate (with fewer insect vectors of the presumed virus agent) and on the sandy soils of California than under Brazilian conditions.

Franco (C. M.) & Bacchi (O.). **Investigações sôbre a 'tristeza' dos Citrus. 1. Alterações da pressão osmótica.** [Investigations on Citrus 'tristeza'. 1. Alterations of osmotic pressure.]—*Bragantia, S. Paulo*, iv, 9, pp. 541–551, 1 graph, 1944. [English summary.]

In healthy Bahia orange plants budded on sour orange stock, the osmotic pressure above and below the union of stock and scion is identical, whereas in those suffering from 'tristeza' [root rot: see preceding abstracts], it is much lower below than above (average of 8·71 and 12·45 atmospheres, respectively). The differences are even more noticeable in the roots.

Speroni (H. A.) & Frezzi (M. J.). **Gomosis axilar de las ramas de los Mandarinos.** [Axillary gummosis of Mandarin branches.]—*Ingeniería agron., B. Aires*, vi, 4, pp. 163–167, 11 figs., 1944.

Since 1935, when it was first observed in the Province of Corrientes, *Diplodia natalensis* has been spreading through the citrus-growing districts of Argentina and causing a disease characterized by symptoms quite unlike those ordinarily associated with this fungus. Irregular, black cankers are formed at the sites of union of the main branches with the trunk and exude an abundant gummy secretion. One- to two-year-old branches shrivel six or seven months after the commencement of infection, while those of four to five years survive for a somewhat longer period, but in an enfeebled condition, with chlorotic, stunted leaves and scanty fruit. The pathogen appears to gain ingress to the host exclusively through injuries, the avoidance of which by rational pruning and cultural methods is an important means of control. Remedial measures are similar to those practised against foot rot (*Phytophthora* [*parasitica* and *P. citrophthora*]), comprising excision of the cankers and treatment of the resultant wound with 1 per cent. mercuric chloride, followed a fortnight later by the application of an impermeable paint. Inoculation experiments with *D. natalensis* on mandarin, sweet and sour oranges, and lemon gave positive results.

Marchionatto (J. B.). **'Mompá', hongo perjudicial a los Citrus.** ['Mompá', a fungus injurious to Citrus.]—*Alm. Minist. Agríc. B. Aires*, xix, pp. 191–192, 1 pl., 1944.

In a previous paper (*Rev. argent. Agron.*, vi, pp. 73–75, 1939), the writer referred the citrus disease popularly known as 'mompá' in Argentina to *Septobasidium pseudopedicellatum* [cf. *R.A.M.*, xx, p. 13]. Subsequently he published a monograph on the species of *Septobasidium* in Argentina (*Darwiniana*, iv, pp. 248–263, 1941), in which the opinion was expressed that two different fungi were concerned in the etiology of 'mompá', viz. *S. pseudopedicellatum* and *S. guaraniticum* [*R.A.M.*, xxi, p. 14]. In order to avoid confusion, the latter and more common species will in future be regarded as the agent of 'mompá' and the former as that of a condition termed 'cinnamon crust'. *S. guaraniticum* is prevalent on oranges, mandarins, and lemons, parasitizing not only the scale insects (*Unaspis citri*, *Lepidosaphes beckii*, and *Aspidiotus hederae*) on the branches, but also the hosts themselves. The coccids are enveloped in a white film with a chestnut-coloured centre, and the mycelium passes to the cortex, on which it forms yellow to cinnamon-coloured lesions, $\frac{1}{4}$ to $\frac{1}{2}$ mm. in thickness, scutiform (2 to 3 cm. long) on the smaller branches

and circular on the larger ones. Later the central portion cracks and darkens to snuff-colour, with a well-defined border fringed with whitish strands. Infected twigs should be excised and burnt, while the lesions on the larger branches may be cut out, these operations being supplemented by the application of 1 per cent. Bordeaux mixture. Infestation of the trees by scale insects may be prevented by treatment with an oil emulsion, miscible oil, or lime-sulphur.

Bartholomew (E. T.) & Sinclair (W. B.). **Navel Orange peel oil and water spot.**—*Calif. Citrogr.*, xxx, 9, 1945.

The results are given of experiments carried out at the Citrus Experiment Station, California, on the nature of water spot of citrus [*R.A.M.*, xxi, p. 368], which is said to be a major problem of Navel oranges in California, and to cause very great losses in some areas. The experiments were planned to determine (1) the moisture and oil in Navel orange peel; (2) the oil in peel of Navel oranges grown in different districts; and (3) the oil from healthy and water spot Navel orange peel. The authors conclude (*a*) that oil sprays do not make Navel oranges susceptible to water spot by changing the quantity of water in their peel; (*b*) that in spite of the fact that the oil content of the peel is least in the districts where water spot is most prevalent, susceptibility does not appear to depend on the quantity of oil in the peel; and (*c*) that a surprisingly large proportion of the oil remains in the water spot areas of the peel for at least several days after they have become shrunken and brown.

Blackford (F. W.). **A Ganoderma root rot of Citrus.**—*Qd J. agric. Sci.*, i, 4, pp. 77–81, 3 figs., 1944.

In September, 1942, a group of ten trees of the Beauty of Glen Retreat variety of mandarin budded on rough lemon stock in an orchard near Gayndah, Queensland, showed symptoms of an unusual type of root rot. One tree had been killed, and had already been uprooted. On the others, the leaves were chlorotic and falling off, while the fruits were small and prematurely coloured. Die-back of the twigs extended to the larger limbs. A few single limbs appeared to be normal and were later ascertained to be supported by an as yet unaffected part of the root. In the dead tree, every main root was rotted. The soil, which was very sandy, was tightly encrusted round affected roots of all sizes, and even, in some instances, round the crown and trunk of the stock. The wood and bark showed a dry, crumbly rot, and when the bark was lifted it broke away, revealing a buff-coloured, furry growth of mycelium on the root cortex.

By March, 1943, sporophores had developed on the upper surface and the fungus was identified as *Ganoderma lucidum* [cf. *R.A.M.*, xix, p. 174; xxiii, p. 369]. Evidence was obtained that infection originated from a dead native tree root, probably belonging to *Eucalyptus paniculata*. Two further cases were observed in other orchards, one of Washington Navel oranges on lemon stock and another of Ellendale Beauty mandarins on orange stock, in the former case the source of infection being probably *E. gummifera* and in the latter probably *E. tessellaris*.

All dead and severely affected citrus trees, with their rotted roots, were dug up and destroyed. The soil was removed from the butts of slightly affected trees, which were surgically treated, and the exposed surfaces disinfected with Bordeaux paint or lime-sulphur 1 in 6. The butt and roots were left exposed to the sun. Growers were recommended not to replant the diseased areas for at least three years.

Wright (W. H.). **Omphalia root rot disease of the Date Palm.**—*Calif. Citrogr.*, xxx, 5, pp. 156–157, 1945.

Omphalia root rot [*O. pigmentata* and *O. tralucida*: *R.A.M.*, xxiii, p. 387], responsible for the most serious losses to the date industry in California, is spread by

planting infected offshoots. In view of the increased demand for offshoots, the date-growers, at a meeting held in January 1945, proposed that quarantine notices be served on proprietors known to have diseased palms as certified by the University of California, that all offshoots on diseased palms and on all palms within 70ft. of diseased palms should be burned under direction of the Agricultural Inspector. The growers seek an appropriation of State funds to finance the employment of a plant pathologist on a survey of *Omphalia* root rot.

Hendrickx (F. L.). **Sur les fructifications conidiennes de Glomerella cingulata (Stonem.) Spauld. et v. Schr. (Sphaeriaceae).** [On the conidial fructifications of *Glomerella cingulata* (Stonem.) Spauld. & v. Schr. (Sphaeriaceae).] —*Commun. Inst. nat. Étude agron. Congo belge*, Recueil 1 (Hors série), pp. 12–15, 4 figs., 1943. [Received August, 1945.]

In this paper the author points out that the coffee parasite *Glomerella cingulata* [cf. *R.A.M.*, xxiii, p. 62] possesses several forms of conidial fructification, including those of *Gloeosporium coffeanum* and *Colletotrichum coffeanum*. He also observed that conidia of *G. coffeanum*, when germinated in a Van Tieghem's cell, sometimes become septate, corresponding to *Marssonia* [*Marssonina*], characterized by 2-celled, hyaline conidia developing in the acervuli. As they germinate, the conidia put out one or, more often, two germ-tubes, suggesting that a scission is present in every conidium. Furthermore the author also observed that the chlamydospores [or appressoria] are able to germinate as soon as the growth conditions allow, producing conidia on conidiophores not distinctly differentiated from the mycelium. This would place the fungus in the Mucedinaceae. After they have formed, the conidia are displaced laterally by the next conidium, but they may remain agglomerated. The hyphal conidia formed in this manner are less squat than those found in the acervuli on coffee leaves; they measure 12 to 24 by 3 to 5 (average 16·3 by 4·1) μ, while those formed on the leaves measure 10 to 16 by 4 to 6 (average 12·6 by 5) μ.

Deslandes (J. A.). **Sôbre a queima do Algodoeiro no nordeste.** [On Cotton scorch in the North-east.]—*Bol. fitossan. Minist. Agric., Rio de J.*, i, 1, pp. 3–18, 5 col. pl., 4 figs., 1944.

In 1935 H. P. Krug first demonstrated the presence of *Fusarium vasinfectum* on cotton at the Textile Plant Experiment Station, Alagoinha, Parahyba [*R.A.M.*, xvi, p. 380], and by the end of 1940, 281 foci of infection had been detected, and as far as possible eradicated, in that State and Pernambuco. The fungus is responsible for heavy losses, amounting to 95 per cent. of the crop in one test on the H. 105 variety in severely contaminated soil. As the term 'wilt' is inappropriate for the symptoms manifested and ambiguous, the author suggests that the disease should be termed 'scorch'.

The pathogen appears to thrive in low-lying, cool, damp, fertile, slightly acid (P_H6·5 to 5·0) soils of a light, sandy texture, with a good admixture of organic matter and some clay, producing rapid and luxuriant growth of the host. Two other associated parasites active under such conditions are *Rhizoctonia* [*Corticium*] *solani* and the nematode *Heterodera marioni*. Analyses of the affected soils revealed an adequate potash content, and neither this nor any of the other mineral fertilizers tested effected any reduction in the incidence of *F. vasinfectum*, but beneficial results were obtained by the incorporation of stable manure into the soil. The climatic conditions of the north-east, with its frequent periods of heavy precipitation, are favourable alike to host and pathogen.

Abelmoschus [*Hibiscus*] *moschatus* was shown to be an alternate host of *F. vasinfectum*, while other plants suspected of acting in the same capacity included *H. sabdariffa*, *Cassiatora*, *Crotalaria juncea*, and *Tephrosia nodiflora*. The occurrence of physiologic races is strongly indicated.

The remnants of diseased plants in the soil constitute the chief source of inoculum. The pathogen may also be transmitted by the seed –probably only to a very slight extent, but even ten infected seeds in a sack of a herbaceous variety, e.g., H. 105, would suffice to maintain a corresponding number of foci in the soil of the new planting site; hence the need for stringent supervision of the seed.

No indigenous varieties available at present combine desirable commercial qualities with resistance to the parasite. The arboreal forms, such as Mocó, though less susceptible than the herbaceous, do not enjoy the immunity that has been claimed for them. To cite some examples from the results of three years' varietal tests, Pima, Giza 3 and 7, Sakha 4, Foadi, Ashmouni, A. Jayawant C. 5480, Indu, Tangüis, Rhyne's Cook 307, Dixie Triumph 37–1795, Toole 38 1781, I.A. 7470–54480, and I.A. 7387-54010 proved resistant (under 10 per cent. infection), while the following gave a satisfactory performance under field conditions: Dixie 14–5, Dixie 14–5 strain 2, Dixie Triumph 85, Acala Mead 2387, I.A. 7470–54493, I.A. 7387–53998, A.F.C. 38–1295, A.F.C. 38–1303, Coker wild strain 2, Delfos 6–102–11, American Red C. 5510, A.F.C. 42–34–1302, A.F.C. 38–1299, R.U. 438–1894, Delta and Pineland II A. 38–1688–5, Delta and Pineland 10–38–1724, Rhyne's Cook, Ucala Shaffer, Texas 7111–028, and U. 44–438–1064 C.A.

The problem of combating the cotton wilt due to *F. vasinfectum* is immensely complicated by the simultaneous presence in the affected regions of *Verticillium albo-atrum*. For the moment, a systematic campaign against *F. vasinfectum* is impracticable owing to the absence, on the one hand, of resistant varieties, and on the other, of an organization for the control of seed production and distribution. Only the general sanitary precautions arising out of the foregoing observations can therefore be recommended.

Leontovitch (C.) & De Saeger (H.). **Marasmius sp., nouveau parasite du Cotonnier dans le District du Congo-Ubangi.** [*Marasmius* sp., a new parasite of the Cotton plant in the District of the Congo-Ubangi.]—*Bull. agric. Congo belge*, xxxi, 1–4, pp. 137–143, 3 figs., 1940. [Flemish summary. Received July, 1945.]

Cotton in the native plantations of the Congo-Ubangi was observed to be affected by sporadic outbreaks of an apparently new disease which caused sudden death of the affected plants. In 1937–8, the affected area included the territories of Bumba, Lisala, and Budjala, i.e., the greater part of the forest area in the cotton-growing zone, and it is more than probable that the disease is present elsewhere also.

The first symptom is loss of turgescence in certain leaves, which in many cases are reddish-yellow, in October, when the plants are actively growing and the bolls have almost reached their maximum size. Later on, the leaves fall, leaving only the bolls which mummify on the dead plants or themselves drop. If the diseased plants are removed, remains of another plant, generally *Aframomum* sp., are usually found adhering to the collar, which is sometimes swollen and covered with a white to brownish-yellow mycelium. The woody vessels in the cotton stem are the colour of wine lees. The presence of the *Aframomum* fragments appeared to be the result of clearing the ground seven or eight months previously, and fructifications of the fungus were found on pieces of the rhizomes of this host lying on the ground. The fungus was identified as a species of *Marasmius*.

Before the disease can spread to cotton the stem tissues must have become lignified; young cotton is not attacked. The mycelium develops on the cotton stems immediately after contact has been made with the *Aframomum* débris, penetration taking place within ten days. Death of the cotton plant ensues most rapidly when the *Aframomum* is in contact with the roots. While isolated cotton plants are most commonly affected, several plants may be attacked together. The

fungus was also found on cut-down banana plants, and in one case had passed therefrom to cotton. It is always transmitted through contact with plant débris, on which it exists saprophytically. The sporophores develop only in the saprophytic phase or after the death of the parasitized host and under conditions of particular humidity; they rapidly dry up. In general, losses due to the disease are under 1 per cent., but are most severe in land poorly cultivated by natives on badly selected sites naturally fallowed for two to four instead of ten to twelve years. The removal and destruction of the affected cotton are recommended. *Aframomum* débris should be collected and burnt before earthing-up the cotton.

Le Coton au Congo belge. [Cotton in the Belgian Congo.]—*Bull. agric. Congo belge*, xxxii, 3, pp. 383–453, 12 figs., 4 graphs, 3 maps, 1941. [Flemish summary. Received July, 1945.]

In the part of this paper dealing with cotton diseases (pp. 408–413), it is stated that wilt, caused sometimes by *Fusarium vasinfectum* var. *gossypii* f. 1 [cf. *R.A.M.*, xix, p. 72; xxiii, p. 431] and sometimes by *Verticillium albo-atrum* [ibid., xviii, p. 248], appeared in the Uélé area of the Belgian Congo some years ago; the outbreak has been checked, but the danger persists. The dispersal of native plantations will limit spread, but complete eradication is hardly possible. The only really effective method of control is the use or development of resistant varieties, such as Dixie Triumph.

Stigmatomycosis of the bolls (*Nematospora coryli* and *N. gossypii*) [ibid., xxiii, p. 431] can be controlled only by the development of early resistant varieties, such as 145 Bambesa, which is almost immune in forest areas.

Anthracnose of the bolls, due to *Colletotrichum* [*Glomerella*] *gossypii*, *Gloeosporium* [*Glomerella*] *gossypii*, or *F. vasinfectum* [ibid., ix, p. 240; xviii, p. 248] can be controlled by planting resistant varieties and avoiding an excess of nitrogenous fertilizers.

Boll bacteriosis (*Bacterium* [*Xanthomonas*] *malvacearum*) [ibid., xv, p. 719] is not prevalent. The effects of damping-off (*Rhizoctonia* [*Corticium*] *solani*) [ibid., xv, p. 578] can be palliated by earthing-up the plants. Where practicable, control can be effected by treating the soil ten days before sowing with ceresan, applied at the rate of 5 l. per sq. m., at a concentration of 1 in 5,000; two days later, the ground should be dug over to a depth of 20 cm. and again treated.

Ezekiel (W. N.). **Effect of low temperatures on survival of Phymatotrichum omnivorum.**—*Phytopathology*, xxxv, 5, pp. 296–301, 1 map, 1945.

Tests were carried out at the Texas Agricultural Experiment Station to determine the reaction of the cotton root-rot fungus, *Phymatotrichum omnivorum*, to low temperatures [*R.A.M.*, xviii, p. 590], a matter of practical importance in relation to the possibility of its survival if introduced into areas north of its present range. The pathogen did not withstand more than 24 hours' exposure in the laboratory to a temperature of –13° C. either in the form of vegetative growth on potato dextrose agar slants, in large sclerotial masses high on the walls of flask cultures, or as portions of sclerotial masses on agar slants or buried in moist soil. Growth was inhibited at 5°, but even after 50 days there was no reduction of viability.

The northern limit to the natural occurrence of root rot is in general agreement with several summaries of recorded temperatures (*Yearb. U.S. Dep. Agric.*, pp. 701–747, 1941), notably in respect of the line at which the minimum observed air temperatures reached 23°. In conjunction with the susceptibility to cold shown by *P. omnivorum* in laboratory trials, this relationship suggests that the northward spread of the disease has been limited by the prevailing temperatures, and that the organism is unlikely to establish itself north of its present range.

Brantley (C. O.). **Japanese Beetle grub control.**—*Greenk. Reptr*, xiii, 2, p. 19, 1945.

Ample supplies of milky disease [*Bacillus popilliae*] spore dust for Japanese beetle [*Popillia japonica*: *R.A.M.*, xxiv, p. 101] control are stated to be now on the market. The spores have been shown to persist in the soil for as long as four years, even after the extermination of all the grubs, and to survive passage through the alimentary tract of birds and small animals, as well as extremes of heat and cold: they are, in short, practically indestructible. The method is economical, 1 lb. dust sufficing for the treatment of 4,000 ft. The preparation, which is harmless to man and livestock, is most effective and speedy in action when applied in the late summer, just after the eggs of the beetle have been laid, or in the spring, immediately prior to the pupation of the grubs. The pathogen multiplies so rapidly in feeding that the death of a single infected grub will release 3,000,000 to 9,000,000 more living spores.

Hendrickx (F. L.). **Une épidémie fongique du Criquet Zonocerus variegatus L. due à Empusa grylli (Fres.) Nowak.** [A fungal epidemic of the Variegated Grasshopper *Zonocerus variegatus* L. due to *Empusa grylli* (Fres.) Nowak.]—*Comman. Inst. nat. Étude agron. Congo belge*, Recueil 1 (Hors série), pp. 16–20, 3 figs., 1943. [Received August, 1945.]

Between December, 1939 and March, 1940, important losses were caused, particularly to cotton and *Pennisetum*, at Bambesa, Belgian Congo, by the variegated grasshopper, *Zonocerus variegatus*, but with the onset of the rainy season the insects rapidly became less numerous as a result of epidemic infection by *Empusa grylli* [*R.A.M.*, xxi, p. 45]. During the dry season the disease remains latent but becomes epidemic at the first rains. The conidiosporangia formed on the first victims are expelled on to their immediate neighbours, presumably in the evening when the insects collect together to sleep. Locally, atmospheric humidity reaches 100 per cent. at night, and this is when the projection of the conidiosporangia takes place most readily. How the fungus continues to exist in the dry season is not definitely known.

At Bambesa, the sporangiophores were distinctly claviform, non-septate, and measured 114 to 164 by 13 to 20 μ. The unicellular, hyaline, piriform or oval conidiosporangia measured 32·8 to 40·4 μ long. Large, hyaline, round, oval, or reniform hyphic bodies gradually spread in infected insects and finally replace the tissues, sporangiophores being formed on the death of the insect.

Langeron (M.) & Guerra (P.). **Les secteurs clairs et sombres des colonies de levures.** [Pale and dark sectors of yeast colonies.]—*Ann. Parasit. hum. comp.*, xviii, pp. 95–111, 6 pl., 1941. [Received April, 1945.]

Pale and dark sectors have been observed in cultures of *Candida guilliermondi*, *C. pseudotropicalis*, *C. parakrusei*, *C. flareri*, *C. pelliculosa*, *C. albicans* [*R.A.M.*, xviii, p. 253], and *C. triadis*, *Rhodotorula* sp., four species of *Torulopsis*, of which *T. pulcherrima* is the most striking, *Hansenula anomala*, *Zygopichia chevalieri*, *Saccharomyces pastorianus*, *Debaryomyces matruchoti*, *D. klöckeri*, *D. guilliermondi*, *D. hudeloi*, and unnamed strains of the same species. The authors discern a correlation between the development of sectors and that of the R and S phases, both processes being dependent on morphogenetic factors and readily reversible. It is important that these facts should be realized in order to guard against the erection of new species on the basis of morphological variations of the kind under discussion.

As examples of mistakes of this sort the authors state that both *Monilia castellanii* and *Cryptococcus interdigitalis* Poll. & Nann. 1936 are undoubtedly the same

as *T. pulcherrima*. The organism named *C. castellanii* by Redaelli is quite different from the true *M. castellanii*, but is identical with *D. matruchoti* Grig. & Peju 1921. The authors consider that the pathogenic role of *Debaryomyces* is very doubtful.

Mackinnon (J. E.) & Artagaveytia-Allende (R. C.). **The so-called genus Candida Berkhout.** *J. Bact.*, xlix, 4, pp. 317–334, 7 figs., 1945.

In these studies at the Institute of Experimental Hygiene, Montevideo, Uruguay, the auxanographic methods of European workers [*R.A.M.*, x. p. 692; xiv, p. 392] were found to be essential to the correct identification of the 14 species of *Candida* investigated. The existence of true dissociation or hereditary changes in some members of this heterogeneous group is regarded as indisputable. One type of variation may be related to the 'R' form of bacteria (Mackinnon's 'membranous variant') [ibid., xix, p. 344] and another, observed in *C. albicans* (Robin) Berkh., 1923, to the 'lethal races' described by Krassilnikov (*Bull. Acad. Sci. URSS*. pp. 364–366, 1934) and Nadson (Changements des caractères héréditaires provoqués expérimentalement et la création de nouvelles races stables chez les levures. Hermann et Cie, Paris) in connexion with *Saccharomyces cerevisiae*.

Like *C. pseudotropicalis* (Cast.) Basgal, 1931, the perfect state of which was found to be *S. fragilis* [*R.A.M.*, xviii, p. 525], *C. krusei* (Cast.) Berkh., 1923 (indistinguishable from *Mycoderma cerevisiae*), has been shown to possess an ascogenous phase referable to the genus *Pichia*.

C. tropicalis (Cast.) Berkh., 1923, a very important species from the medical mycologist's standpoint, comprises strains producing an abundance of true hyphae, which may in turn give rise to arthrospores, and even appressoria. Chlamydospores were not observed. *C. intermedia* (Cif. & Ashf.) Langeron & Guerra, 1938, differs in various important respects from *C. tropicalis* and is considered to be devoid of medical interest.

C. pelliculosa Redaelli, 1925, seems to approximate more closely to *Torulopsis* than to *Candida*, while *C. flareri* (Red. & Cif.) Langeron & Guerra, 1938, is believed to have originated as a white variant of *Rhodotorula mucilaginosa*.

C. albicans and *C. stellatoidea* (Martin, Jones, Yao, & Lee) Langeron & Guerra, 1939, possess a number of common features, including the production of true mycelium, similar chlamydospores, and 'membranous' or 'R' variants. *C. stellatoidea*, however, differs from *C. albicans* in its negative auxanogram with sucrose and in its non-pathogenicity to rabbits, and must be admitted as a valid species. In the writers' opinion, Langeron and Guerra were dealing with the 'R' form of *C. albicans* and not with *C. stellatoidea*.

Neogeotrichum pulmoneum (*Oidium brasiliense*) Magalhaes 1918 (*Mem. Inst. Osw. Cruz*, xxvi, pp. 151–167, 1932), is thought to be identical with *C. suaveolens* (Lindner) Langeron & Guerra, 1938. The supposed responsibility of the latter for bronchomycosis appears to rest on confusion with two true pathogens, *C. tropicalis* and *C. albicans*.

Conant's claim that *Syringospora* Quinquaud was the first validly published genus for these yeasts [*R.A.M.*, xix, p. 555] is accepted. Some species, such as *C. albicans*, *C. stellatoidea*, and *C. parakrusei* (Cast.) Langeron & Guerra, 1938, are common parasites of the mucous membranes, which seem to constitute their normal habitat, while others, e.g., *M. cerevisiae* (*C. krusei*), *S. fragilis* (*C. pseudotropicalis*) and *C. chalmersi* (Cast.) Basgal, 1931, are saprophytes outside the human body. *C. brumpti* (Langeron & Guerra) Langeron & Guerra, 1938, has been reduced by some authors to synonymy with *C. parakrusei*, but the present writers do not concur in this view, since the former species does not ferment glucose, grow at 37° C., or utilize sucrose, whereas it does produce true mycelium and chlamydospores.

Millikan (C. R.). **'Damping off' disease of Flax.**—*J. Dep. Agric. Vict.*, xliii, 4, pp. 177–181, 6 figs., 1945.

Damping-off of flax seedlings occurs in all the principal flax-growing areas of Victoria [*R.A.M.*, xxiii, p. 55], where the P_H values of the soils range from 5 upwards. Occasionally, the disease has resulted in very unsatisfactory brairds, but on the whole its effects have been of minor importance. The condition is favoured by any factor which delays the rapid germination and emergence of the seed, such as very cold weather, deep sowing, and excessive soil moisture. The formation of a hard crust on the ground surface in very dry weather also aggravates the disease. The vigour of individual seed lots sometimes appears to affect incidence, and some crop failures due to damping-off have occurred where pasture has been ploughed up and sown at once to flax.

Numerous isolations were made from affected material, but the only fungus consistently obtained was a species of *Pythium*, the oospores of which, measuring 13·8 to 15·2 μ in diameter, were readily found in the roots and cotyledons.

Lime applied to soil in pot tests on withertop [calcium deficiency] disease [ibid., xxiii, p. 228] had a marked effect on damping-off twelve months later. In Gnarpurt soil, incidence for the following treatments, viz., superphosphate 1 cwt. per acre, and the same plus slaked lime 1, 2, and 4 tons (P_H 6, 7·1, 7·6, and 7·9, respectively), was 46·5, 22, 12, and 10·5 per cent., while in Digger's Rest soil (P_H 7·1, 7·6, 7·9, and 8·2, respectively), the corresponding figures were 34·7, 12, 14·7, and 12·3 per cent. The exact reason for this effect has not been ascertained.

When flax seed, half of which had been treated with a fungicidal dust, while the remainder was untreated, was sown at Lismore in soil with P_H 5·1, the treated seed germinated well, but the germination of the untreated was uniformly bad and the surviving plants showed severe *Pythium* damage. A test was then conducted in which a sample of the untreated seed (a large proportion of which showed cracks in the seed coat) was treated with various dusts and sown in the area where the crop had failed. Four of eight blocks received lime at the rate of 2 tons per acre immediately before sowing. Very dry conditions prevailed, and the seedlings which failed to emerge showed numerous reddish-tan lesions associated with *Pythium*. The percentage emergence was 19·1 for the untreated seed, 30·2 for spergon (4 oz. per bush.), 34·6 for new improved semesan jr. (4 oz.), 34·4 for nomersan (8 oz.), 25·2 for ceresan (4 oz.), 39·4 for new improved ceresan (4 oz.), 27·5 for agrosan (4 oz.), and 30·3 for agrosan (8 oz.). Emergence in the lime-treated plots was 31·5 per cent., as against 28·6 per cent. in the untreated. One month after treatment, during which period the treated seed was kept in air-tight containers, a germination test showed that the seed treated with new improved ceresan gave only 52 per cent. normal seedlings, while the radicles of the abnormal seedlings were much swollen, against 89 per cent. normal seedlings for the untreated seed, and 83 to 90 per cent. normal seedlings for the other treatments. The seed treated with new improved ceresan should be sown as soon after treatment as possible.

Cochrane (V. W.). **The effect of brief temperature treatments on germination of urediospores of Phragmidium mucronatum (Fr.) Schlecht.** —*Phytopathology*, xxxv, 5, pp. 361–366, 1945.

Large increases in the germination of single-line rose rust (*Phragmidium mucronatum*) uredospores from a Californian collection at 6° to 9° C. were effected by ten minutes' warming the germinating spores in an incubator at 27°, the maximum (amounting to 526·3 per cent. over the control in one test at 6°) occurring when the exposure was made within eight hours of sowing; after 24 hours the high temperature failed to stimulate the process. The germination of the uredospores at temperatures above or below the optimum was significantly raised by one hour's preliminary incubation at the optimum of 18°, spores treated in this manner

and then exposed to temperatures of 6°, 9°, 24°, and 27° showing increases over the controls, held throughout at these temperatures, of 725, 163, 16, and 308 per cent., respectively.

These observations point to the need of extreme care in the adjustment of the temperature in germination experiments. It should be remembered, moreover, that in nature a brief spell of favourable temperature may induce spore germination on the leaf even under generally adverse weather conditions, a consideration suggesting caution in the application of laboratory data to field problems.

Creager (D. B.). **Saving Picardy bulbs by chemical treatments.**—*Gladiolus Suppl.* [*New Engl. Gladiolus Soc.*], ix, 1, pp. 2–3, 1945. [Abs. in *Chem. Abstr.*, xxxix, 11, pp. 2371–2372, 1945.]

Apparently sound, size 5 Picardy *Gladiolus* bulbs were selected from a lot in which 10 to 15 per cent. were discarded on account of *Fusarium* brown rot [*F. oxysporum* var. *gladioli*: *R.A.M.*, xxiii, p. 300] and divided into three equal batches, one being immersed for 15 minutes in new improved ceresan (½ lb. per 25 gals. water plus 5 tablespoonfuls Grasselli spreader-sticker), another in 1 in 1,000 mercuric chloride solution for 14 hours, and a third left untreated as a control. The number of bulbs was counted at the end of the first year and the same bulbs were replanted the second year, with the identical treatments. The results showed new improved ceresan to be greatly superior to mercuric chloride for the purpose in view, the number of bulbs surviving at the end of the second year being about twice as high in the former as in the latter series. None of the untreated bulbs was dug at the end of the second year. Similar, but even more striking results were obtained by the application of the same preparations to bulblets and the small stock arising therefrom. The injury to bulbs from new improved ceresan reported by some growers may be attributed to planting in dry ground or to undue delay in planting after treatment.

Creager (D. B.). **Summary of 1944 Gladiolus disease control studies in Illinois.**—*Gladiolus Suppl.* [*New Engl. Gladiolus Soc.*], ix, 1, pp. 3–5, 1945. [Abs. in *Chem. Abstr.*, xxxix, 11, p. 2372, 1945.]

Out of a total of 660 Picardy *Gladiolus* bulbs in each lot, the numbers of healthy ones produced after various treatments [against *Fusarium oxysporum* var. *gladioli*: see preceding abstract] were: new improved ceresan (½ lb. per 25 gals. water) for 15 minutes, 504; 1 in 1,000 mercuric chloride for 14 hours, 476; 0·5 per cent. lysol for three hours, 401; 0·5 per cent. compound cresol solution U.S.P. XI, 398, and control, 165. Picardy bulblets immersed for 14 hours in cresol, lysol, or mercuric chloride at the foregoing dosages yielded, respectively, 38, 36, and 23 lb., compared with 31 for the control lot. Five consecutive lots of bulbs were treated with one batch of new improved ceresan without reduction of efficacy. Du Pont (Grasselli) spreader-sticker was found to be the best of the wetting agents tested. Semesan and a number of inorganic mercury compounds, as well as immersion in water heated to 122° F., proved less satisfactory for the control of the disease.

Hansen (H. N.) & Thomas (H. Earl). **Diseases of Fremontia.**—*Madroño*, viii, 2, pp. 39–42, 1 pl., 1945.

The following diseases restrict the cultivation in California of *Fremontia*, an attractive ornamental of south-western origin. Stem-girdling (*Phytophthora cactorum*) was first observed on nursery stock in 1934, since when it has been prevalent on specimens of *F. californica*, *F. napensis*, and *F. mexicana* up to 15 ft. in height. The bark is killed right round the stem at or near soil-level, occasionally higher, and wilting of the parts above the necrotic area soon ensues. Inoculation experiments with pure cultures of the fungus gave positive results both on wounded and

uninjured stems. Excess moisture and inadequate drainage appear to be largely responsible for this destructive disease, the incidence of which could be reduced by attention to these factors.

Verticillium albo-atrum has occasionally been observed attacking the roots of cultivated species, its mycelium invading apparently sound tissues and ultimately extending through most of the xylem, even of the petioles and leaf veins. The stele becomes discoloured, the plants are stunted, and the foliage wilts and falls. Small specimens are killed in three to five months. Inoculation experiments on the three above-mentioned species were successful.

Hendersonia fremontiae Harkn. n. comb. (*Ascochyta fremontiae* Harkn.) produces dark- to black-edged, necrotic lesions of varying sizes on the leaf blades of *F. californica* and *F. napensis* in nature and has been inoculated into the same species and *F. mexicana* with positive results. The colour and multiseptate condition of the conidia and other characters of the fungus necessitate its transference from *Ascochyta* to *Hendersonia*.

Septoria angularis n. sp. forms angular, brown, extensively coalescent, necrotic spots on *F. mexicana* and was successfully inoculated into the other two above-mentioned species. The fungus is characterized by subepidermal, erumpent, densely aggregated, globose, ostiolate, black pycnidia, 50 to 70 μ in diameter, and oblong, predominantly uniseptate, hyaline conidia, 10 to 17 by 1·5 to 2 μ.

Pirone (P. P.). **Control of the gall disease of Gypsophila caused by Phytomonas gypsophilae (Brown) Magrou.** *Phytopathology*, xxxv, 5, pp. 368–369, 1945.

During the last four years the gall disease of *Gypsophila paniculata* (*Phytomonas* [*Pseudomonas*] *gypsophilae*) [*R.A.M.*, xiii, p. 772] has caused heavy damage on newly grafted plants. The soft, nodular excrescences, up to 4 cm. in diameter, develop mainly on the upper cut surface of the rootstocks in the region of insertion of the scion, impeding the union of the two elements of the graft and causing the death of plants within a month. Of the various plant-protectives tested for the control of the pathogen, calcium hypochlorite proved the most effective, 97·6 to 100 per cent. of the grafts immersed for two to three minutes in a solution of 2 to 6 oz. per gal. remaining healthy compared with 4 to 60 per cent. of the untreated.

Jenkins (W. A.). **A Cercospora leafspot of cultivated Physostegia.**— *Phytopathology*, xxxv, 5, pp. 324–331, 2 figs., 1945.

A destructive leaf spot of *Physostegia virginiana* occurred over a restricted area in Virginia in 1943, and Dr. B. B. Higgins reports that the same disease was present in Georgia in 1941. The symptoms first appear in the latter part of June, but are scarcely perceptible before the end of July and do not assume an epidemic form until August. Pale yellow with dark centres at first, the lesions develop through shades of brick-red to a final pale to dark brown, frequently enlarging to cover most of the leaf blade.

The pathogen produced a *Cercospora* regarded by Professor Chupp as new and labelled by him (in herb.) *C. physostegiae*, besides typical *Mycosphaerella* spermogonia and perithecia. Cultures from conidia and ascospores were identical in all measurable respects. The perfect state, designated *M. physostegiae* n. sp., is characterized by innate-erumpent, ovate to subglobose, black perithecia, 47 to 95 by 40 to 75 μ, with a papillate ostiole at maturity; clavate, short-stipitate, fasciculate, aparaphysate, bitunicate asci, 36 to 40 by 10 to 20 μ, containing eight bicellular, straight to slightly curved, hyaline to subhyaline, guttulate ascospores, 11·6 to 17·8 by 2 to 3·8 μ; innate-erumpent, ovate to globose, black, ostiolate spermogonia, 27 to 60 by 27 to 56 μ; rod-shaped, hyaline spermatia, 1·5 to 4 by 0·5 to 0·8 μ, arising endogenously and liberated through sterigma-like processes; fasciculate, geniculate, basally pigmented, continuous or uni- to pluriseptate, mostly

short conidiophores; and hyaline to subhyaline, cylindrical-clavate, curved, uni- to sexseptate, guttulate conidia, obtuse at the basal end, tapering to subacute at the distal, 17 to 112 by 2·28 to 6·08 (mostly 48 to 60 by 3·8 to 4·2) μ.

It would appear from one season's observations that *M. physostegiae* is controllable by the removal and burning of the shed foliage any time between leaf fall and the following mid-April.

Fischer (G. W.). **The stem smuts of Stipa and Oryzopsis in North America.**—*Butler Univ. bot. Stud.*, vii, pp. 25–39, 6 figs., 1945.

After pointing out that over much of the 'Western Range', comprising 728,000,000 acres, species of *Stipa* and *Oryzopsis* are prominent members of the grass cover and are commonly affected with stem smut, 15 to 20 per cent. of the plants being frequently, and 90 per cent. occasionally, attacked, the author states that a study of the identity of these smuts revealed the fact that for over 80 years stem smuts of *Stipa* and *Oryzopsis* have been collected in the United States under the name *Ustilago hypodytes* [*R.A.M.*, xxii, pp. 240, 361], whereas in point of fact six distinct species and one variety in two genera are actually represented. These fungi (a key to which is given) are *U. minima*, *U. nummularia*, *U. spegazzinii* and its var. *agrestis* (both on *Stipa* spp. only), *U. williamsii*, *U. jacksonii* (on *S. lettermani* only), and *U. fraserii* (on *S.* spp. only).

Preliminary work on the pathological histology of these smuts showed that with all the species except *U. fraserii* and *U. minima* the smut appeared to be entirely superficial.

No trace whatever was found of any stroma between the chlamydospore mass and the host epidermis, as described by Elisa Hirschhorn for some of these smuts on *Stipa* in Argentina [cf. ibid., xix, p. 710].

Fischer (G. W.) & Hirschhorn (Elisa). **A critical study of some species of Ustilago causing stem smut on various grasses.**—*Mycologia*, xxxvii, 2, pp. 236–266, 6 figs., 1945.

During a study of the stem rusts of *Stipa* and *Oryzopsis* [see preceding abstract] it was discovered that the binomial *Ustilago hypodytes* has for many years been applied to a complex of smut fungi rather than to one species. From the study of hundreds of herbarium specimens from North and South America, Europe, Asia, and Africa, most of which were identified as *U. hypodytes* by prominent mycologists, it is concluded that this complex embraces four species and one variety of smut fungi which are separable into two groups. In the first group, comprising *U. spegazzinii* and its var. *agrestis* (epispore finely papillose or minutely echinulate) and *U. williamsii* (epispore smooth) the spores possess bipolar areas or appendages while in the second, comprising *U. halophila* and *U. nummularia* the spores are smooth and lack bipolar areas or appendages.

For each of the above-mentioned fungi the authors give a description and details of spore germination, a list of its hosts, its geographical distribution, and a list of all the specimens examined.

Stapel (C.). **Kløverens Skorpesvamp (Phyllachora trifolii) som Aarsag til dødelig Forgiftning af Heste.** [The Clover scab fungus (*Phyllachora trifolii*) as the cause of fatal poisoning of Horses.]—Reprinted from *Ugeskr. Landm.*, *1942*, 2 pp., 1 fig., 1942. [Received August, 1945.]

Outbreaks of clover scab [black blotch] (*Phyllachora* [*Cymadothea*] *trifolii*) [*R.A.M.*, xxi, p. 527] are stated to have been of rare occurrence in Denmark during the present century, though apparently general in former times, according to E. Rostrup (1901). In August, 1942, however, the writer observed a severe attack of the disease, and in this connexion attention is drawn to an alarming

report from Germany (*Z. PflKrankh.*, li, pp. 435–441, 1941) of mortality among farm horses from the consumption of infected clover (fresh and hay) [*R.A.M.*, xx, p. 583].

Tomkins (R. G.). **Impregnated wraps for fruit.**—*Food Manuf.*, xx, 4, pp. 140–141, 1945.

The following conclusions as to the control of fruit decay by the use of impregnated wraps are reached on the basis of the author's experiments at the Low Temperature Station for Research in Biochemistry, University of Cambridge and Department of Scientific and Industrial Research, and of a survey of the relevant literature. Laboratory and commercial trials have clearly demonstrated that the decay of some kinds of stored fruits, notably citrus, is to some extent preventable by the application of wraps impregnated with certain volatile fungicides [*R.A.M.*, xiv, p. 321; xxiii, pp. 104, 252] causing no visible injury or taint, and that the incidence of rotting in eggs can be reduced by storage in similarly treated flats and fillers [ibid., xx, p. 465]. None of the substances so far found effective for the objects in view is altogether ideal, and their use at this stage would probably contravene the food regulations of Great Britain and other countries. The discovery of a material free from any of the present objections would be of great practical advantage.

Ward (K. M.). **The treatment of little-leaf of deciduous fruit trees.**—*Qd J. agric. Sci.*, i, 4, pp. 59–76, 6 figs., 1944.

During the past few years, little leaf [*R.A.M.*, xviii, p. 687] has become increasingly prevalent in a number of varieties of fruit trees in the Stanthorpe area of Queensland. Apples are more often affected than other deciduous fruits, but the condition is quite common on pears and stone fruits.

Experiments in apple orchards from 1937 to 1941 showed that a winter spray of a 5 or 2½ per cent. solution of zinc sulphate in water gave a satisfactory response in a few months, though spring foliage sprays containing up to 2 per cent. of zinc sulphate had little or no immediate effect. Winter sprays also gave more enduring effects than spring ones. Broadcasting and ploughing-in 5 lb. zinc sulphate round an affected tree gave beneficial results in the second and third years after treatment. Tree injections were not satisfactory.

It is concluded that winter spraying is likely to give the best results, though in the early treatment of the disorder winter spraying in conjunction with soil treatment is probably advisable.

Kemp (H. K.) & Beare (J. A.). **Black spot of Apple.**—*J. Dep. Agric. S. Aust.*, xlviii, 9, pp. 374–380, 12 figs., 1945.

Apple scab (*Venturia inaequalis*) causes considerable losses to growers in South Australia, especially in the cooler, wetter parts of the Adelaide Hill, where the best orchards are situated. Overwintering in the conidial phase on the dormant bud scales was not observed, and the critical period for control, therefore, is during ascospore discharge [*R.A.M.*, xix, p. 104], which was found to extend approximately from late August to mid-October, very few discharges occurring in August. In spray trials reasonable control was obtained on most varieties with sprays at the green-tip, pink, and petal-fall stages, the following schedule being found generally effective: at the green-tip stage Bordeaux mixture 6–4–40; at the pink stage, just before the blooms open, lime-sulphur 1 in 40 gals.; at the petal-fall stage, lime-sulphur 1 in 60–80 gals.

In wet districts two Bordeaux sprays applied at the early green-tip and closed- to open-cluster stages may be desirable, and lime-sulphur at approximately 1 gal. to 100 gals. water may be included in the first cover spray two weeks after petal-fall if the spring has been wet.

Singh (U. B.). **Leaf spot disease of Apple in Kumaun.**—*Indian Fmg*, v, 12, pp. 566–567, 1944.

Heavy damage is caused annually in the apple orchards of Kumaun, United Provinces, India, by the leaf spot due to *Phyllosticta pirina* [*Phoma prunicola*: *R.A.M.*, xvi, p. 106], which first appears at the end of June, reaches a climax in the middle of August, and continues until defoliation ensues in October. The infected fallen leaves give rise to perithecia (*Mycosphaerella* sp.) in the following summer, and these serve to perpetuate the fungus the next season. Inoculation experiments demonstrated the capacity of the pathogen to invade its host through both injured and intact leaf surfaces, the strain from apple being able to attack pear and vice versa. The incubation period of *P. prunicola* ranges from 9 to 12 days.

The disease may be effectively combated by one application of 2–10–40 Bordeaux mixture at the dormant, open-cluster, or petal-fall stage. The operation may be carried out with a 'Four Oaks' or bucket sprayer, the former costing Rs 120 and the latter Rs 20, and a pressure of 75 lb. per sq. in. should be maintained throughout.

Wilkinson (E. H.). **Perennial canker of Apple trees in England.**—*J. Pomol.*, xxi, 1–4, pp. 180–185, 2 pl., 1945.

In the autumn of 1941, apple branches showing severe die-back and canker were received by the author for examination. From both types of lesion, a fungus subsequently identified as *Gloeosporium* [*Neofabraea*] *perennans* [*R.A.M.*, xxiii, pp. 66, 444] was isolated. The name 'perennial canker' is used for the disease in the present paper to prevent confusion with the canker due to *Nectria galligena*. The writer suggests that the disease of the fruit caused by *Neofabraea perennans* should be called 'bitter rot' as it is impossible in this country to distinguish it from the bitter rot caused by *G. album* and *G. fructigenum* [*Glomerella cingulata*].

On branches the most serious aspect of the disease in England is the die-back that results from the invasion of summer pruning cuts. The lesions extend from $\frac{1}{2}$ to 6 in. behind the cuts, deeper penetrations being usually found on older branches. The die-back rapidly spreads, causing longitudinal splitting and peeling of the bark, exposing the swollen, brown, cortical tissues. These dry out and turn black. The limit of the lesion is marked by a groove-like ring of callus, laid down by the end of November in most cases, but frequently delayed until spring. Cankers are formed by penetration of the fungus into all types of bark injuries, especially those due to woolly aphis [*Eriosoma lanigerum*], but they also arise by extension of die-back of a lateral branch into the stouter member bearing it. The cankers are elliptical, slightly sunken, and surrounded by a callus ring.

On the fruits the disease is essentially a storage rot, but it was identified once among lenticel rots of Allington Pippin before picking, in early October. In cold store it usually appears in November and December, when small, circular, flattened or concave lesions appear, each with a lenticel at the centre. This centre is, as a rule, pale brown and surrounded by a darker brown marginal zone, but lesions showing no colour zonation are often found on the coloured side of the fruits. Individual lesions seldom exceed $1\frac{1}{4}$ in. in diameter, and depth of penetration about equals half the surface diameter. Acervuli, originating under the skin, burst irregularly through it, and produce white masses of spores embedded in mucilage. Storage losses from the disease are slight. In 1937–8 and 1938–9 only 0·03 and 0·01 per cent., respectively, of numerous apples examined were found to be attacked. Recently, infections by *Neofabraea perennans* have occurred more frequently, the fungus having been isolated from fruits grown in Somerset, Warwickshire, Worcestershire, Cheshire, Kent, and Cambridgeshire.

Inoculation tests showed that the fungus penetrates bark only through injuries, but causes rot in apple fruits through lenticels or skin wounds. Pruning experi-

ments demonstrated that infection takes place through summer but not winter cuts. The disease is unlikely to make headway in orchards where only winter pruning is practised.

Beakbane (A. Beryl) & Thompson (Eleanor C.). **Abnormal lignification in the wood of some Apple trees.**—*Nature, Lond.*, clvi, 3953, pp. 145-146, 2 figs., 1945.

The authors state that histological investigations at the East Malling Research Station of what is known as the 'rubbery wood' condition [*R.A.M.*, xxiv, pp. 22 and 153], observed in Lord Lambourne apple trees, show that the flexibility of the stems is associated with a lack of lignification of many of the xylem fibres and vessels. Lignification appeared to be normal in one-year-old lateral shoots from 'rubbery' branches, except for occasional small areas near the cambium. In older shoots, and in the main stems of one-year-old trees, most of the summer wood was unlignified, and even the spring wood was found to be unlignified in some very severely affected shoots more than two years old. This lack of lignification can be seen by the naked eye when a cross-section of the wood from a living branch is suitably stained. In the unlignified areas the walls of the vessels and fibres gave the usual staining reactions of cellulose. The vessels had irregularly shaped walls and some had collapsed altogether. The xylem fibres were more or less circular in section, with abnormally thick walls. In general, they resembled the description of the gelatinous fibres of tension wood (B. J. Rendle in *Trop. Woods*, lii, p. 11, 1937), but, contrary to these, they often passed round the whole stem. Miller's Seedling and Dartmouth Crab varieties, growing near affected Lambourne trees, showed a similar lack of lignification, as also did James Grieve.

Zeller (S. M.) & Schuh (J.). **Diseases and insect pests of cane fruits in Oregon.**—*Bull. Ore. agric. Exp. Sta.* 418, 58 pp., 27 figs., 1944.

This paper deals with the following diseases of cane fruits in Oregon: cane gall (*Agrobacterium* [*Bacterium*] *rubi*), crown gall (*A.* [*Bact.*] *tumefaciens*), hairy root (*A.* [*Bact.*] *rhizogenes*), decline disease [raspberry decline virus: *R.A.M.*, xxii, p. 318], dwarf disease [ibid., xvii, p. 473: xx, p. 69], red raspberry mosaic [raspberry mosaic virus], leaf and cane spot (*Septoria rubi*), anthracnose (*Elsinoe veneta*), orange rust (*Gymnoconia interstitialis*), yellow rust (*Phragmidium rubi-idaei*), cane blight (*Leptosphaeria coniothyrium*) [*Coniothyrium fuckelii*], mildew (*Sphaerotheca humuli*), spur blight (*Didymella applanata*), *Verticillium* wilt (*V. albo-atrum*), mushroom root rot (*Armillaria mellea*), stamen blight (*Hapalosphaeria deformans*), and various fruit moulds. A control chart is appended.

Schuh (J.) & Zeller (S. M.). **Insect pests and diseases of Strawberry in Oregon.**—*Bull. Ore. agric. Exp. Sta.* 419, 40 pp., 21 figs., 1944.

The authors describe the following diseases of strawberry in Oregon: the viruses crinkle, stunt, witches' broom, and yellows, leaf spot (*Mycosphaerella fragariae*), scorch and leaf blight caused, respectively, by *Diplocarpon earliana* and *Dendrophoma obscurans* [*R.A.M.*, xxiii, p. 378], mildew (*Sphaerotheca humuli*), *Armillaria* crown rot (*A. mellea*), red stele root rot (*Phytophthora fragariae*), root rots, believed to be caused in Oregon by *Rhizoctonia* and *Verticillium*, fruit rots, of which the most important is associated with *Botrytis* grey mould [*B. cinerea*], and a physiological disease, alkali yellows. A control chart is appended.

Varghese (M. K.). **Bunchy top disease of Plantains.** *Indian Frng*, vi, 5, pp. 239–240, 1945.

Bunchy top of plantains [*R.A.M.*, xx, p. 290], first reported from Kottayam, Travancore, about six months ago, now extends over the whole town, where almost every garden shows a few infected stools, while some small plantations have already been destroyed. The disease appears to have been present in the locality

for at least three years, though its seriousness was not at first recognized by the ryots. It has now been notified as a disease to which the provisions of the Travancore Plant Pests and Plant Diseases Act XII of 1904 apply. A special temporary staff has been appointed to deal with the situation, and most of the ryots are co-operating in the effort to bring the disease under control. The method adopted is to dig up infected roots, chop them up, and bury them in deep pits with 1 ft. of well-rammed earth on top.

Horsfall (J. G.). **Quantitative bioassay of fungicides in the laboratory.**—*Bot. Rev.*, xi, 7, pp. 357–397, 1945.

The author reviews and critically evaluates the progress that has been made in devising laboratory techniques for the testing of fungicides. A bibliography of 125 titles is given, most of which have already been the subject of notice in this *Review*.

Stapel (C.) & Petersen (H. I.). **Forsøg med Kobberoxyklorid ('Kobberkalk') og nogle andre Specialpraeparater til Bekaempelse af Svampesygdomme.** [Experiments with copper oxychloride ('copper-lime') and some other proprietary preparations for the control of fungous diseases.]—*Tidsskr. Planteavl*, xlvii, pp. 468–496, 1943.

In experiments from 1939 to 1942 to determine the value as plant-protectives of a number of (*a*) copper-free and (*b*) copper-containing substitutes for, or accessories to, Bordeaux mixture, apples in various parts of Denmark were treated against scab (*Fusicladium dendriticum*) [*Venturia inaequalis*: see next abstract] with (*a*) pomarsol [*R.A.M.*, xxii, p. 314], an organic sulphur compound, 20 per cent. thiocarbamic acid derivative; sulsol (40 per cent. colloidal sulphur) [ibid., xiii, p. 745; xvi, p. 765; xvii, p. 689]; cosan (49·1 per cent. colloidal sulphur) [ibid., vi, p. 670]; and Bayer 1192a, a copper-free organic compound: (*b*) bouisol (15 per cent. metallic copper); cuprasol [see next abstract]; Bayer 2343, vitigran, and Bordola-copper lime (all consisting of copper oxychloride with 15 per cent. copper); copper-lime C 35b; and silisan A and B, alkaline copper silicates with 4 and 3·5 per cent. copper, respectively.

Pomarsol (0·75 per cent.) appreciably reduced the incidence of scab, though its action was less powerful than that of Bordeaux; it is, however, free from deleterious effects on the trees. Sulsol and bouisol were applied jointly in five trials at 0·5 per cent. each, with results generally comparable to those secured with pomarsol. Cuprasol was used in four tests at a dosage of 0·75 per cent. for pre- and 0·5 per cent. for the post-blossom sprays. Its efficacy was practically equivalent to that of Bordeaux, the percentages of foliar and fruit scab on Laxton's Superb, for example, being reduced from 66·8 and 60·7 to 38·2 and 15·5, respectively, by cuprasol compared with 42·2 and 16·5 for the standard treatment. A tendency to cause scorching, however, appeared in the later applications in 1942. Copper-lime C 35b was less effective than Bordeaux mixture, while silisan A and B combined and the latter alone caused such heavy damage as to preclude their further use. Vitigran at 1 per cent. approximated in efficacy to Bordeaux mixture; spray injury was virtually restricted to the later treatments, for which a milder fungicide should be substituted. Bordola copper-lime and Bayer 2343 were less effective than Bordeaux, besides causing injury. Bayer 1192a was also inferior to Bordeaux but was non-injurious. Cosan (0·1 per cent.) merits further trials as a post-blossom spray.

The following were tested against potato late blight (*Phytophthora infestans*) on the Majestic, King Edward, and Bintje varieties in 1941: Bordeaux mixture 2–1–100, vitigran 2 and 1 per cent., copper-lime Bayer 0·5 and 0·4 per cent., and silisan B 5 per cent. These preparations reduced the average amount of foliar blight from 4·1 to 1·8, 2·3, 2·5, 2·6, 2·7, and 3 per cent., respectively, and of tuber infection

from 8·5 to 1·8, 2·1, 3·8, 3·4, 3·4, and 3·5 per cent., respectively, while increasing the yield from 294 to 334, 317, 321, 321, 305, and 304 hectokg. per ha., respectively. In the 1942 tests on King Edward and Bintje, apart from Bordeaux mixture 2–1– and 1–1–100, egosan (copper oxychloride with 45 per cent. copper) 1 per cent., vitigran 2 per cent., and pioner 13 (copper oxychloride with 2·8 per cent. copper) 1 per cent. gave the best results, all reducing foliar blight from 4·2 to 2·5 per cent. Vitigran 2 per cent. gave the largest yield increase, which amounted to 388 hectokg. per ha. as against 316 for the control plots, and 384 for Bordeaux 2–1–100 and pioner 0·6 per cent. Two dusts, Dana Bordeaux and Dana potato, the latter a copper oxychloride preparation with 7·2 per cent. copper, applied three times, each at the rate of 40 kg. per ha., gave 2·7 and 2·6 per cent. foliar blight compared with 2·1 per cent. for Bordeaux (two 2 per cent. sprays) and 4·1 per cent. for the control.

Stapel (C.) & Petersen (H. I.). **Afprøvning af kemiske bekaempelsesmidler mod plantesygdomme og skadedyr.** [Testing of chemical remedies against plant diseases and pests.]—*Tidsskr. Planteavl*, xlviii, pp. 631–654, 1944.

The excellent results secured in experiments in 1943 with the standard spray schedule (first treatment 1–1–100 Bordeaux mixture, second and third 2 in 100 lime-sulphur, remainder white Bordeaux ½–1–100) in apple scab (*Fusicladium*) [*Venturia inaequalis*] control [see preceding abstract] point to its use wherever practicable, except on such copper-sensitive varieties as Beauty of Boskoop and Golden Delicious. Cuprasol, an arsenic-copper oxychloride mixture, 13 to 14 : 19 or 14·5 : 8·6 per cent., the former applied at the rate of (*a*) 0·75 per cent. before and 0·5 per cent. after blooming, and the latter at (*b*) 1 and 0·75 per cent., respectively, was similarly effective against the disease, but caused even more severe damage to the leaves and fruits. The use of this preparation should be restricted to pre-blossom treatments and a milder one substituted for the later applications. Colloidal sulphur X, cosan, and agrosol, containing 54, 50, and 40 per cent. sulphur, respectively, are less powerful fungicides than the foregoing, but may find a use on copper-sensitive varieties if preceded by stronger pre-blossom treatments and applied once or twice extra in the late summer.

List of common British plant diseases (compiled by the Plant Pathology Committee of the British Mycological Society).—61 pp., Cambridge University Press, 1944. 5*s*.

Developments in the study of pathology, taxonomy, and nomenclature since the publication of the second List of Common Names of British Plant Diseases [*R.A.M.*, xiv, p. 325] and the ensuing explanatory articles in the British Mycological Society's Transactions [ibid., xv, p. 467; xviii, p. 754] have necessitated revision and amplification, and at the same time the opportunity was taken to remodel the list. The scientific names of the parasites having proved to be at least as useful as the names of the diseases, the title has been changed. Furthermore, the host plants, now arranged in one alphabetical series, include a preliminary list of trees.

The scientific names of the parasites have again been carefully scrutinized, and some minor alterations necessitated by the adoption of certain general principles have been made. For instance, on reconsideration it is concluded that the Rule that nomenclature starts with the perfect state of a fungus was probably not intended to apply to the Phycomycetes, and since its use in connexion with this group has proved quite impracticable, attempts to uphold it have been abandoned. Further, to avoid several unacceptable changes in the scientific names of common rusts, advantage has been taken of J. C. Arthur's interpretation that the transfer of *Uredo* names is valid. A third modification consists in the use of the conidial name for the majority of fungi of which the perfect state has not been recorded from Britain.

As regards bacterial names, Dowson's system [ibid., xxi, p. 364] has been followed, partly because his conception of the genera *Pseudomonas* and *Xanthomonas* has already been widely accepted in this country and in America. Under this scheme of classification *Bacterium* is used as a generic name and the *Erwinia* combinations are given as synonyms whenever possible.

In view of the alphabetical arrangement of the hosts, the index of their common names has been omitted, but the list of authors' names and abbreviations is retained and a new index has been added, comprising the scientific names of the hosts and parasites and well-known synonyms. An index of the foreign common names is also included.

Garrison (E. R.). **Sources of Oospora lactis on dairy farms.** —*Res. Bull. Mo. agric. Exp. Sta.* 388, 15 pp., 1945.

Sources of the common milk and cream contaminant, *Oospora lactis* [*R.A.M.*, xxiv, p. 282] on Missouri dairy farms were found to include barn dust (especially that raised by grooming the cows); milk equipment (80·6 per cent. of 36 separators, 76·7 per cent. of 60 milk pails, and 65·2 per cent. of 23 strainers); dry feeds (50 per cent. of 50 concentrate mixtures, 17 per cent. of 188 individual concentrates, and 19·9 per cent. of 141 hay samples); silage (especially maize); cow manure (the major source of infection on dairy farms); field and garden soils (28·8 per cent. of 52 and 46·4 per cent. of 28 samples, respectively); and cistern water (29·8 per cent. of 84 samples).

Meyer (J. R.). **Ação bacteriostática de um cogumelo macroscópico pertencente à família das Poriporaceas 'Polyporus cinnabarinus (Jacq.) Fries'.** [Bacteriostatic action of a macroscopic fungus belonging to the family of the Polyporaceae '*Polyporus cinnabarinus* (Jacq.) Fries'.] —*Arq. Inst. biol. S. Paulo*, xv, pp. 27–36, 1944. [English summary.]

In a further study on the bacteriostatic action exerted by extracts of *Polyporus cinnabarinus* [*R.A.M.*, xxiii, p. 493] the author showed this to be limited by the following factors: density of the bacterial suspension, thickness of the agar layer, hydrogen-ion concentration of the fungal extract, and the incubation period of the cultures.

Schatz (A.) & Waksman (S. A.). **Strain specificity and production of antibiotic substances. IV. Variations among Actinomycetes, with special reference to Actinomyces griseus.**—*Proc. Nat. Acad. Sci., Wash.*, xxxi, 5, pp. 129–137, 1945.

A strain of *Actinomyces griseus*, characteristically producing streptomycin, gave rise to variants producing no aerial mycelium and no streptomycin and showing other properties distinct from the parent strain. Sporulating and streptomycin-producing strains, comparable to the original, were isolated, however, from the non-sporulating variants. The original strain had all the properties of *Streptomyces* [*R.A.M.*, xxiii, p. 150], whereas the inactive variant could be classified within the genus *Nocardia* [ibid., xiii, p. 259; xvi, p. 316]. The authors, therefore, raise the question as to what extent many of the species of *Nocardia*, isolated from natural substrates, represent variants of *Streptomyces* spp. which have lost the capacity of producing aerial mycelium.

Waksman (S. A.). **Microbial antagonisms and antibiotic substances.**—ix. + 350 pp., 1 pl., 17 figs., 3 diags., 14 graphs, New York, The Commonwealth Fund, $3.75. London, Oxford University Press, 1945. £1. 2*s*.

The author describes this treatise as an attempt 'to present the broad interrelationships among micro-organisms living in association, either in simple mixed cultures or in complex natural populations, with special attention to the antagonistic effects'. Among the aspects of mycological or phytopathological interest

referred to may be mentioned Actinomycetes and fungi as antagonists, the chemical nature of antibiotic substances, and the microbiological control of soil-borne diseases. A bibliography of 1,016 titles is appended.

Lee (S. W.), Foley (E. J.), & Caley (E. R.). **'Fissibactericidal' nature of penicillin action.**—*Nature, Lond.*, clvi, 3950, p. 49, 1945.

The authors consider that a new word is required to describe the particular kind of bactericidal action exemplified by the action of penicillin on susceptible organisms (e.g., *Staphylococcus aureus*) and connoting an agent toxic to bacteria only when they are growing or dividing. The term 'fissibactericide' is tentatively suggested.

Brian (P. W.) & McGowan (J. C.). **Viridin: a highly fungistatic substance produced by Trichoderma viride.**—*Nature, Lond.*, clvi, 3953, pp. 144–145, 1945.

The authors describe a fungistatic substance, produced from several strains of *Trichoderma viride* [cf. *R.A.M.*, xxiv, p. 68], which they propose to name 'viridin'. The least concentration of the new substance required to prevent germination of *Botrytis allii* conidia was 0·005 μgm. per ml. as against 3·0 of gliotoxin, 0·5 mercuric chloride, and 0·025 di(ethylmercuri) hydrogen phosphate. This high sensitivity to viridin extends also to *Fusarium* spp., *Trichothecium roseum*, and *Cephalosporium* spp., whereas a number of species of *Penicillium* and *Aspergillus* require concentrations of 3 to 6 μgm. per ml. to prevent germination. Viridin does not appear to be markedly bacteriostatic.

Fischer (A. M.). **Food yeast—a source of protein and vitamins.** *Brew. Dig.*, xx, 2, pp. 39–41, 46, 3 figs., 1945.

Full details are given of the author's process for the production of a highly nutritious protein- and vitamin B-containing preparation with the aid of *Torulopsis utilis* var. *major* [*R.A.M.*, xxiii, p. 72] from blackstrap molasses [cf. ibid., xxiv, p. 282].

Weston (W. H.). **Problems in the nature and control of tropical deterioration.**—*Amer. Dyest. Reptr*, xxxiv, 5, pp. P 91–P 93, 1945.

This general survey of the problems connected with the fungal deterioration of textiles and its control in the South and South-west Pacific theatres of war [*R.A.M.*, xxii, p. 479 *et passim*], presented at the annual meeting of the American Association of Textile Chemists and Colorists, Atlantic City, New Jersey, on 14th October, 1944, was followed (pp. P 93–P 95) by a discussion.

Hopley (M.) & Jackson (J. R. F.). **Proofing textiles against rot, mould and mildew.**—*Text. Rec.*, lxiii, 749, pp. 41–42, 59, 1945.

Shirlan (salicylanilide), developed by the British Cotton Industry Research Association [*R.A.M.*, x, p. 598], is an extremely effective anti-mildew agent for cotton, linen, and woollen textiles, being colourless, odourless, non-volatile, and non-toxic. Among potential alternatives to shirlan, thallium carbonate is perhaps the best, but its cost is prohibitive for mildew-proofing. The chlorinated phenols are too volatile to afford more than temporary protection, while the nitrophenols turn the fibre yellow; both groups, moreover, are toxic and liable to cause dermatitis. Organo-mercurials are unstable in the presence of other metals and therefore ill adapted to application on ordinary textile machinery, while their fungicidal activity is also reported to be inhibited by contact with certain sulphur compounds. Other mildew-proofing substances beginning to find favour include Product VF (mercapto-benzthiazole) and 2:2′-dichloro-5:5′-dihydroxydiphenylmethane, but they seem unlikely to displace shirlan to any great extent at the moment.

Rot-proofing processes based on chromium are highly resistant to weathering. The simplest form of chromium treatment is the so-called 'chrome tinting',

involving impregnation with basic chromium sulphate or acetate, followed by after-treatment with alkali, and sometimes with copper sulphate. The resistance of chrome-tinted cotton to micro-organisms is comparable to that of ordinary mineral khaki-dyed material.

Copper rot-proofing methods in current use consist of treatment with cuprammonium hydroxide, copper carbonate, or copper soaps, of which the last-named, especially the naphthenates, are more resistant to the leaching action of rainfall than the other two. The chief disadvantage of the copper soaps is their adverse effect on the 'handle' of the fabric and, in the case of copper naphthenate, the characteristic odour they impart. Copper carbonate is possibly the simplest of the three compounds to apply, either by (*a*) impregnating the cloth with copper sulphate and then fixing the copper as its basic carbonate by after-treatment with soda ash, or (*b*) direct addition of a soda ash to a copper sulphate solution to produce a copper carbonate suspension for the impregnating liquor. After impregnation with cuprammonium hydroxide, the fabric is dried to drive off ammonia and reprecipitate the copper as its hydroxide. Duck cloths and canvases treated by this method are rot- and weather-resistant, but difficulties of preparation limit its use.

Marsh (P. B.), Greathouse (G. A.), Butler (Mary L.), & Bollenbacher (Katharina). **Testing fabrics for resistance to mildew and rot.**—*Tech. Bull. U.S. Dep. Agric.* 892, 22 pp., 1 fig., 1 diag., 1945.

A simple apparatus is described for the exposure of mildew-proofed fabrics to water-leaching under controlled conditions [cf. *R.A.M.*, xxiv, p. 281].

Several fungi, including a species of *Trichoderma*, have been found capable of tendering treated fabric of a higher copper content than that attacked in similar trials by the common test organisms, *Chaetomium globosum* [ibid., xxiv, p. 330] and *Metarrhizium* [? *glutinosum*: ibid., xxiii, p. 494; xxiv, p. 380]. *C. globosum*, however, appears to be the most satisfactory organism for use in tests on non-sterile fabric. Steam sterilization of material containing common organic preservatives, viz., pentachlorophenol, salicylanilide, 2,2′-dihydroxy-5,5′-dichloro diphenylmethane, and tetrabrom-o-cresol, decreased resistance to the last-named fungus in a number of instances even when applied for as short a period as 15 minutes at 15 lb. pressure.

A culture procedure is described in which the test fabric is planted on a mat of mycelium growing on a filter-paper strip supported on a salt agar medium. Used in this way, *C. globosum* attacked treated materials much more severely than when applied by the pipette-inoculum method. The presence of independently nourished mycelial inoculum, capable of repeated infection of the strip at many points, is believed to simulate in part the highly exacting conditions of soil burial.

In connexion with the capacity of the bottles used in the tests, the question arose of the quantity of air space necessary inside the container to provide sufficient oxygen for fungus growth and complete breakdown of the fabric. Neither *M.* [? *glutinosum*], *C. globosum*, nor *Stemphylium* sp. effected total disintegration of 8-oz. cotton duck in 500-c.c. bottles, while the quart-size air space was adequate for the two first-named but not for *S.* sp.

Of a number of preservatives tested, 2,2′-dihydroxy-5,5′-dichloro diphenylmethane was shown to possess exceptional fungicidal properties, while copper naphthenate [ibid., xxiv, p. 380] has proved consistently more effective per unit weight on fabric than various other copper compounds used in the experiments.

Lin (C. K.). **Nutrient requirements in the germination of the conidia of Glomerella cingulata.**—*Amer. J. Bot.*, xxxii, 6, pp. 296–298, 1945.

The author found the conidia of *Glomerella cingulata* so lacking in carbon and other foods as to be unable to initiate even the earliest stage of growth, and it

was only after several experiments that complete normal germination was achieved by means of a solution containing small quantities of dextrose, ammonium nitrate, monopotassium phosphate, and magnesium sulphate. This behaviour is in marked contrast with that of *Sclerotinia fructicola*, which has already been shown [*R.A.M.*, xx, p. 414] to require nothing but an energy material for germination.

In the case of *G. cingulata*, the elements carbon, magnesium, nitrogen, phosphorus, and sulphur have been proved to be indispensable, and the minimum requirement of nitrogen and phosphorus was found to be about 10^{-4} γ per spore. Potassium has not been demonstrated to be indispensable and there was nothing to show that an external supply of any organic substances is required, other than sugar. This is believed to be the first report of mineral nutrition in the germination of fungus spores.

Gastaud (J. M.). **Étude histochimique du pigment colorant Sphaerotheca humuli (D.C.) Burr.** [A histochemical study of the pigment colouring *Sphaerotheca humuli* (D.C.) Burr.]—*Ann. Éc. Agric. Montpellier*, N.S., xxvi, 3, pp. 39–45, 3 figs., 1944.

A histochemical study [by methods which are described] of the pigment producing the black coloration of the perithecia of *Sphaerotheca humuli* showed the presence of melanin.

Edmundson (W. C.), Landis (B. J.), & Schaal (L. A.). **Potato production in the western States.** Revised.—*Fmrs' Bull. U.S. Dep. Agric.* 1843, 58 pp., 45 figs., 1945.

Included in this bulletin, first published in 1940, are sections on potato seed-tuber certification and disinfectant treatment; the virus, non-parasitic, fungal, and bacterial diseases of special importance on crops grown under the semi-arid conditions of the western United States; spraying, dusting, and the selection of resistant varieties.

Potato haulm killing with T.A.C. compounds.—*J. Minist. Agric.*, lii, 5, pp. 215–217, 1945.

The results of trials carried out under the supervision of the technical officers of the War Agricultural Executive Committees and others suggest that for the killing of potato haulm against blight [*Phytophthora infestans*], although T.A.C. sprays were shown to be 10 per cent. less efficient than sulphuric acid, they are still efficient for the purpose and are more satisfactory to the small grower. At present the T.A.C. sprays, which are being produced for experimental purposes only, cost nearly four times as much as sulphuric acid—about £2 per acre for material; yet some growers, who dislike sulphuric acid, use sprays equally or even more expensive. If further results are satisfactory, the manufacturers hope to reduce the price. An improved type of T.A.C., 36c, which has little effect on the skin, mixes more readily with water, and gives a rather better haulm kill than T.A.C. 2, has been developed for testing.

Samuel (G.). **Guard against Potato blight.**—*J. Minist. Agric.*, lii, 4, pp. 159–161, 1945.

The continuous substantial losses of potatoes due to blight [*Phytophthora infestans*] in England, except during the driest years, has induced the author [*R.A.M.*, xxiii, p. 496] to emphasize the necessity of the wider adoption of control measures, namely good earthing-up to protect the tubers in the soil, spraying with Bordeaux mixture (4-5 hydrated lime—40), the first application being made before there is any sign of blight, the second three or four weeks after the first, and a third in wet seasons if blight is severe; and destruction of the haulm before lifting. Two sprayings (or six dustings in Lincolnshire) may increase the yield by 1 to 3 tons or more per acre. Clamp sites should be cleared up thoroughly as soon as riddling is finished.

Nandi (H. K.). **Potato in Assam.**—*Indian Fmg*, v, 12, pp. 551–554, 3 figs., 1945.

The most virulent potato disease in Assam, especially in the Khasi Hills, is late blight (*Phytophthora infestans*), early blight (*Alternaria solani*) being more common in the plains. Scab (*Actinomyces scabies*) is widespread and occasionally serious, while the very prevalent ring disease (*Bacillus* [*Xanthomonas*] *solanacearum*) is responsible for heavy losses of stored tubers in the plains from June to August.

Fagundes (N. B.). **Cancro da Batata-Synchytrium endobioticum (Schilb.) Perc.** [Potato wart—*Synchytrium endobioticum* (Schilb.) Perc.]—*Bol. fitossan. Minist. Agric., Rio de J.*, i, 1, pp. 37–41, 2 figs., 1944.

This is a summary of the available information concerning the nomenclature, geographical distribution, host range, symptoms and effects, etiology, and control of potato wart (*Synchytrium endobioticum*).

Peru is the only South American country from which the disease has as yet been reported [*R.A.M.*, xxiii, p. 316; cf. also xiii, p. 291].

Nobrega (N. R.) & Silberschmidt (K.). **Sôbre uma provável variante do virus 'Y' da Batatinha (Solanum virus 2, Orton) que tem a peculiaridade de provocar necroses em plantas de Fumo.** [On a probable variant of Potato virus Y (*Solanum* virus 2, Orton) which has the property of inducing necroses in Tobacco plants.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 307–330, 3 pl., 1944. [English summary.]

Further studies are described on a virus disease of the Peruvian Serrana Negra potato variety [*R.A.M.*, xxi, p. 94] herein designated 'vein necrosis', the most distinctive property of which is its capacity to induce severe necrosis on healthy tobacco plants a week to a fortnight after inoculation. At first the symptoms are virtually confined to the smaller veinlets, but at a later stage the plants become very stunted. The reactions of the White Burley variety to the virus were particularly marked.

From infected tobacco plants vein necrosis was transmitted by sap inoculation to the White Burley, Havana, and Geudertheimer tobacco varieties, *Nicotiana glutinosa*, *N. langsdorffii*, and *N. longiflora*, and possibly to *Petunia* sp. and Marglobe tomato, on which the symptoms were doubtful. Most of these plants are known to be susceptible to virus Y. On the other hand, *Datura stramonium*, which is immune from the latter, likewise withstood infection by the vein-necrosis virus. The disease was further conveyed by the aphids *Myzus persicae* and *Macrosiphum solanifolii* to healthy White Burley tobacco plants, which developed the typical symptoms of vein necrosis.

The physical properties of the Peruvian potato virus were shown by *in vitro* tests to resemble in some degree those of the Y group. The former succumbed to a temperature of 58° C., lost its infectivity in dilutions above 1 in 1,000, retained its activity for seven days, survived for 2½ hours in the presence of 50 per cent. alcohol, and was destroyed by desiccation. The writers conclude that the virus is a variant of the potato virus Y group with a special tendency to the production of necrotic symptoms on tobacco.

Springer (Martha E.). **A morphologic study of the genus Monoblepharella.**—*Amer. J. Bot.*, xxxii, 5, pp. 259–269, 46 figs., 1 diag., 1945.

A full account is given of a study made of 11 isolates of *Monoblepharella* found in tropical and semi-tropical soils, including a detailed description of the development and morphology of *M. taylori* [*R.A.M.*, xxiv, p. 389]. The main characteristics of *M. elongata*, *M. mexicana*, and *M. laruei* are indicated, and the paper terminates with a comparison of the genera *Monoblepharella* and *Monoblepharis*.

Lundblad (K.). **Bristsjukdomar hos odlade växter.** [Deficiency diseases of cultivated crops.]—23 pp., 4 figs., Stockholm, Statens Livsmedelskommission, 1945.

In this account of trace element deficiencies in crop plants, beet heart rot, due to lack of boron, manganese deficiency of oats and numerous other plants, and copper deficiency of oats, wheat, barley, timothy [*Phleum pratense*], and other crops are stated to occur in Sweden. Directions are given for the detection and control of such deficiencies.

Reinking (O. A.). **Report on Cinchona diseases in Guatemala.**—*Plant Dis. Reptr*, xxix, 17, pp. 432–439, 1945. [Mimeographed.]

The author reports the results of a rapid survey of *Cinchona* plantings in Guatemala, made from 20th to 22nd January, 1943 [*R.A.M.*, xxiv, p. 119]. Damping-off of seedlings in seed-beds was not serious in well-managed plantings and was attributed to the ordinary damping-off fungi found in practically all tropical soils. A *Rhizoctonia* [ibid., xviii, p. 729] was isolated from affected plants and a *Pythium* reported to occur in diseased seed-beds. Post-emergence damping-off was severe in some beds and it was stated that a *Phytophthora* had been isolated from plants thus affected. Control was readily effected by Bordeaux mixture or yellow cuprocide. The fungus is regarded as capable of attacking any species of *Cinchona*. Die-back and stem canker of nursery stock was observed on *C. ledgeriana* and *C. calisaya*. The disease is characterized by the dying-back and blackening of the young growing tips of plants. A *Phytophthora* [ibid., xx, p. 8] isolated from such diseased nursery stock is regarded by A. Müller as the causal organism.

A serious stem and crown canker disease of older trees planted in the field was reported and attributed to incompatibility between *C. ledgeriana* and *C. succirubra* grafts producing weak plants subject to infection, although this combination has been practised for years in Java and elsewhere. It is suggested that a *Phytophthora* should be looked for as the parasite causing this disease, and that the *Nectria* frequently present on dead parts may be secondary. Further investigation is required of an apparent root rot present in some areas on certain strains of *Cinchona* of the *ledgeriana* narrow-leaf type. A. Müller has reported a *Rosellinia*-like fungus [ibid., xvi, p. 408] on the roots of dead trees on one of these plantations.

An unidentified leaf-spotting, of obscure etiology, but possibly nutritional in origin, was common on all three plantations visited. In the earliest stages the spotting is characterized by minute water-soaked spots, which become dark red-brown with sunken centres. The oldest spots show ashen-grey centres, with dark reddish-brown borders. The leaves may be wrinkled and in severe cases defoliation may occur. The disease has not caused any widespread damage, except in certain narrow-leaf *C. ledgeriana* strains. Some clones appear to show resistance. The disease requires investigation.

Other leaf diseases observed were sooty mould (*Capnodium* spp.), associated with a scale insect (*Saissetia hemisphaerica*); algal leaf-spot (*Cephaleuros virescens*); a marginal leaf scorch thought to be non-parasitic; a general leaf-reddening, often produced by abnormal weather conditions; a black-blotching of leaves covered with pumice from the active volcano Santa Maria, attributed to rubbing; and a leaf mottle or chlorosis believed to be nutritional.

Arruda (S. C.). **A 'escaldadura das fôlhas', doença da Cana de Açúcar, nova no Brasil.** ['Leaf scald', a Sugar-Cane disease new to Brazil.]—*Arq. Inst. biol. S. Paulo*, xv, pp. 142–196, 5 pl., 1944. [English summary.]

Further information is presented concerning sugar-cane leaf scald (*Phytomonas* [*Xanthomonas*] *albilineans*) in São Paulo, Brazil [*R.A.M.*, xxiv, p. 338], where it

is stated to have been present since 1937, though the agent was not recognized until 1943 and the disease was originally designated 'albinism'. It is thought to have been introduced into the State from Australia between 1926 and 1930 on the N.G. 24 A, H.Q. 426, Badila, and Q. 13 varieties. Although not at present of great economic importance, the disease is potentially serious as attacking the early-maturing varieties essential for manufacturing purposes. Of 13 varieties tested for their reactions to the pathogen, P.O.J. 2725, C.P. 11/65, Co. 290, and U.S. 1694 were classed as resistant, P.O.J. 2878 and P.O.J. 100 as moderately resistant, C.P. 28/11, C.P. 29/320, Co. 281, and C.P. 27/139 as moderately susceptible, and C.P. 28/19, P.O.J. 213, and C.P. 28/60 as susceptible. P.O.J. 213, despite its susceptibility in these trials, has so far escaped infection in the field. The chronic form of leaf scald is more prevalent in São Paulo than the acute.

Diseased seed pieces and knife infection appear to be mainly responsible for the spread of the bacterium. Experimental inoculations demonstrated the pathogenicity of the juice extracted from the young leaves and spindle of canes with the latent form of the disease. Seed-cane selection and roguing of diseased stools are recommended as control measures, and a special system of indexing stools in the latent phase is proposed as a means of localizing infection.

Martin (J. P.). **Pathology.**—*Rep. Hawaii Sug. Exp. Sta., 1943–4* (ex *Printed Reps. Hawaii Sug. Pl. Ass., 1944*), pp. 22–27, 1944.

The author [cf. *R.A.M.*, xxiii, p. 288] points out that, as a result of the establishment of airfields bordering plantations and of faster and more frequent trans-Pacific services between Hawaii and other countries, insect-carried diseases, such as Fiji disease, have a much better opportunity of propagation.

Plantation inspections showed that the rapid spread of 32–8560 [ibid., xxii, p. 344] has done much for disease control, particularly in the case of eye spot [*Helminthosporium sacchari*], areas seriously attacked formerly being now free. Growing of resistant varieties is responsible for the conspicuous absence of mosaic disease. Moderate to severe brown stripe disease [*H. stenospilum*] [ibid., xxiii, p. 288] was recorded on localized areas of plantations on windward Kaui island. Leaf scald [*Xanthomonas albilineans*] [loc. cit.] is still serious on parts of Hawaii, and chlorotic streak disease persists on low-lying fields [loc. cit.].

A local *Penicillium* species isolated from banana produces a high yield of penicillin by the submerged culture method, and it has been demonstrated that the strain of *Fusarium oxysporum* isolated from diseased prickly pear [ibid., xxiv, p. 109], inhibited the growth of *Staphylococcus aureus*.

A table shows the tolerance to local and foreign diseases of the 15 sugar-cane varieties occupying upwards of 1,000 acres in the territory.

The varieties 32–8560 and 32–1063 are the most widely cultivated, and are resistant to all local diseases.

Service and regulatory announcements, October–December, 1944.—Plant quarantine import restrictions, Republic of Peru.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, p. 103, 1945.

Supreme Decree No. 511 of 23rd September, 1943, as modified by Supreme Decree No. 612 of 15th December, 1943, introduces the following among other amendments to the Supreme Decree of 3rd June, 1942, regulating the importation of flax seed into Peru [cf. *R.A.M.*, xxi, p. 352]. The Directorate of Agriculture authorizes the importation, exclusively through the Society for the Encouragement of Flax Cultivation, of flax seed only from regions in which wilt (*Fusarium lini*) is absent, and subject to the accompaniment of the consignments by duly authenticated certificates vouching either for this condition or for the freedom from infection of the particular lots concerned.